NASA: Explore. Discover. Understand.

National Aeronautics and
Space Administration

Exploration Systems Mission Directorate

NASA Headquarters
Washington D.C. 20546

NP-2005-05-401-HQ

National Aeronautics and Space Administration

NASA

2004

FISCAL YEAR

IPP

INNOVATIVE
PARTNERSHIPS
PROGRAM

VALUE

TO NASA AND THE NATION

BENEFITS

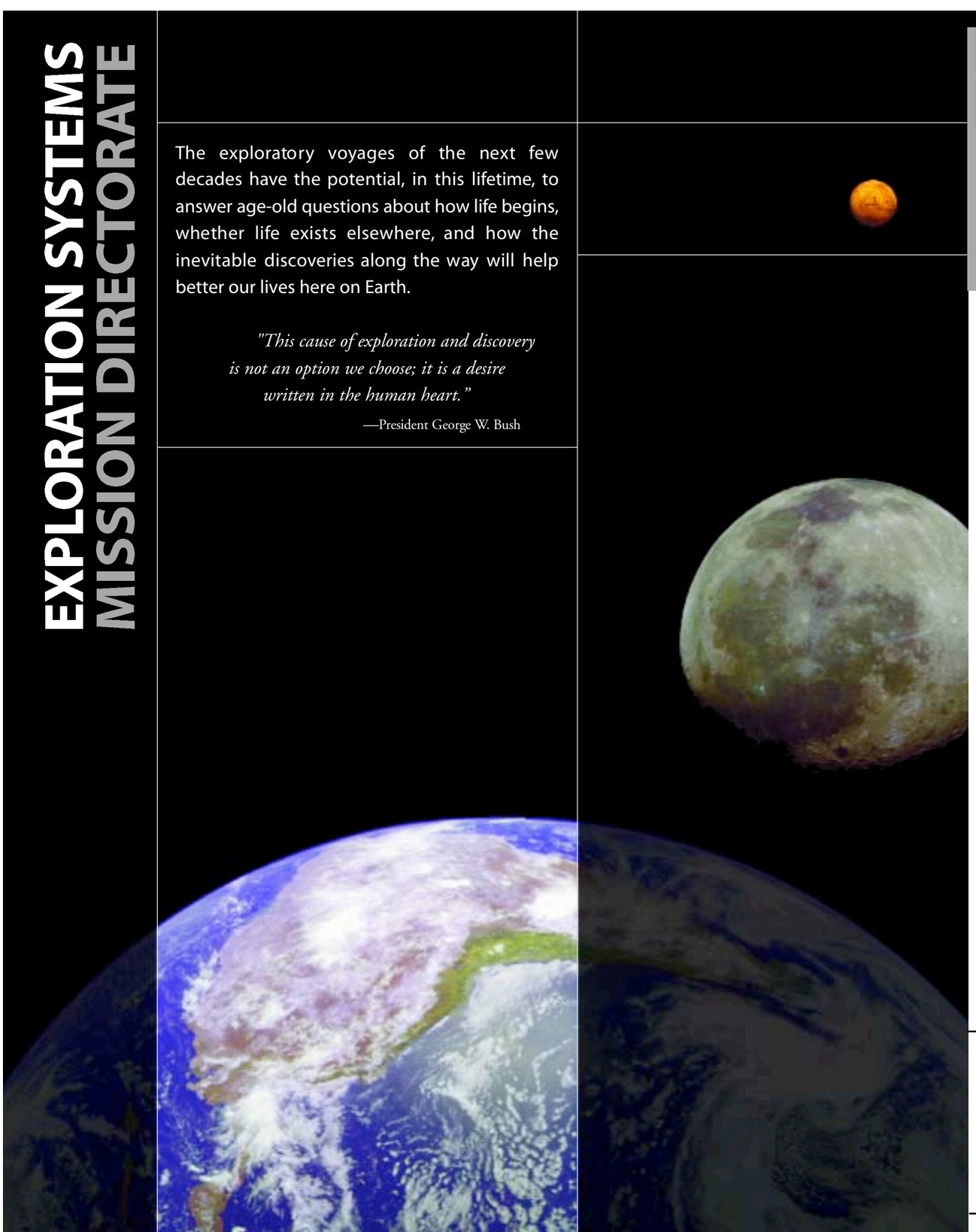
FOR ALL MANKIND

EXPLORATION SYSTEMS MISSION DIRECTORATE

The exploratory voyages of the next few decades have the potential, in this lifetime, to answer age-old questions about how life begins, whether life exists elsewhere, and how the inevitable discoveries along the way will help better our lives here on Earth.

"This cause of exploration and discovery is not an option we choose; it is a desire written in the human heart."

—President George W. Bush



LETTER FROM

OVERCOMING CHALLENGES, CREATING OPPORTUNITIES

BENJAMIN J. NEUMANN, DIRECTOR
INNOVATIVE PARTNERSHIPS PROGRAM

When President George W. Bush announced in January 2004 his new vision for exploration of the moon, Mars and beyond, NASA heard the call to action.

In that announcement, the President acknowledged the benefits of our nation's investment in technology development and directed NASA to pursue opportunities outside the Agency to provide the technologies needed to make the new vision a reality.

In response, the Innovative Partnerships Program (IPP) was formed, incorporating the former Innovative Technology Transfer Partnerships (ITTP) program. IPP is an important program within the Exploration Systems Research and Technology (ESR&T) Theme and the Exploration Systems Mission Directorate. With its national network of technology transfer offices and affiliated organizations, and the relationships these groups have with industry and academic research institutions across the United States, the IPP is in an excellent position to locate and transfer into NASA the new technologies that NASA needs to meet the Vision for Space Exploration.

Partnership building has always been at the heart of NASA's success, and its results benefit the space program and the nation. The IPP creates partnerships that bring in technologies developed outside of NASA, but are critical to the Agency's missions, and those that allow NASA technologies to enhance U.S. industrial growth and economic competitiveness.

In 2004, the IPP (then known as ITTP) facilitated 155 partnerships between NASA and industry, academia and other government agencies. These relationships, which are in addition to NASA Small Business Innovative Research (SBIR) awards, are yielding technologies and helping to accelerate projects throughout NASA, resulting in commercial products while saving the Agency millions of dollars.

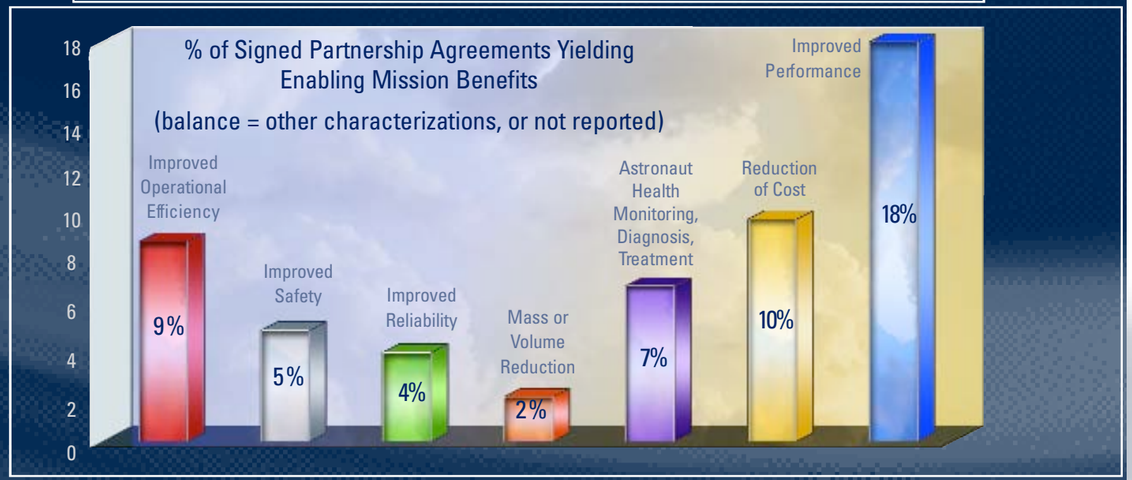
The IPP network has been critical to these successes. Spread out across the U.S., our network members keep their fingers on the pulse of their regions, recognizing opportunities to form partnerships that benefit their communities, NASA, and all U.S. citizens.

The IPP is fully ready to face the challenges and opportunities that lie ahead as NASA focuses on the Vision for Space Exploration. By partnering with businesses, universities, and other agencies, the IPP extends to all Americans an opportunity to contribute to this new great mission of exploration and discovery.

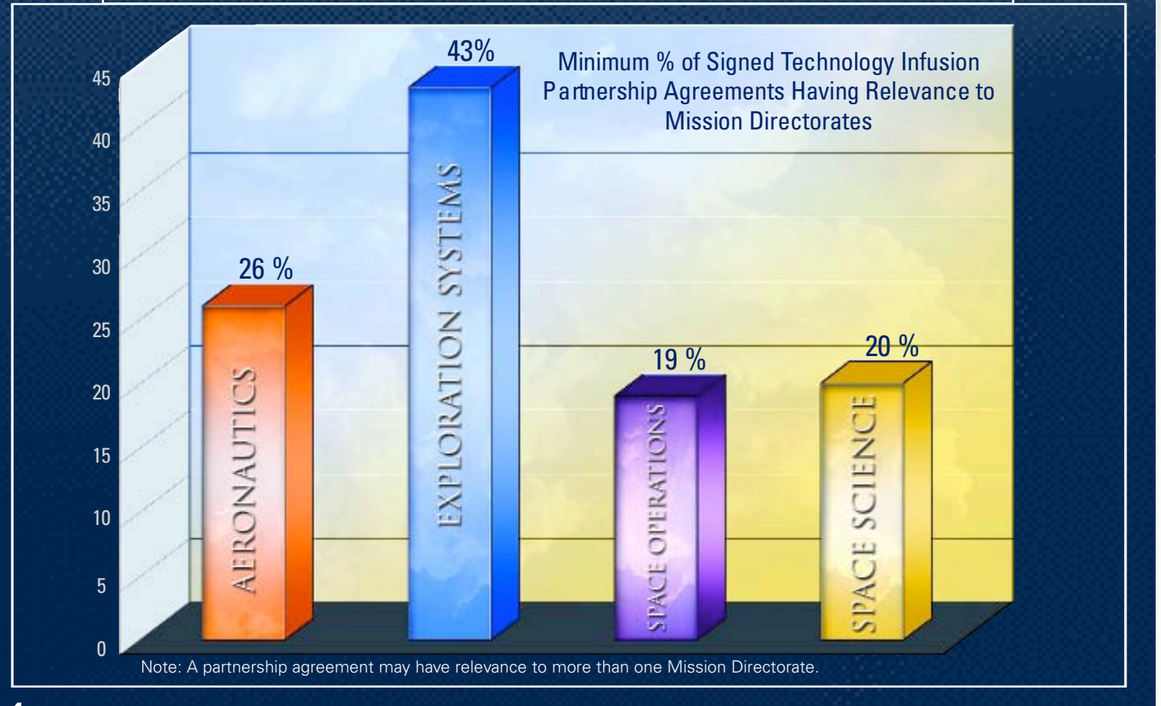
TECHNOLOGY INFUSION

The IPP seeks out solutions in industry, academia and other government labs to meet NASA's technology needs.

ENABLING NASA MISSION BENEFITS OF TECHNOLOGIES INFUSED



TECHNOLOGY RELEVANCE TO NASA MISSION DIRECTORATE

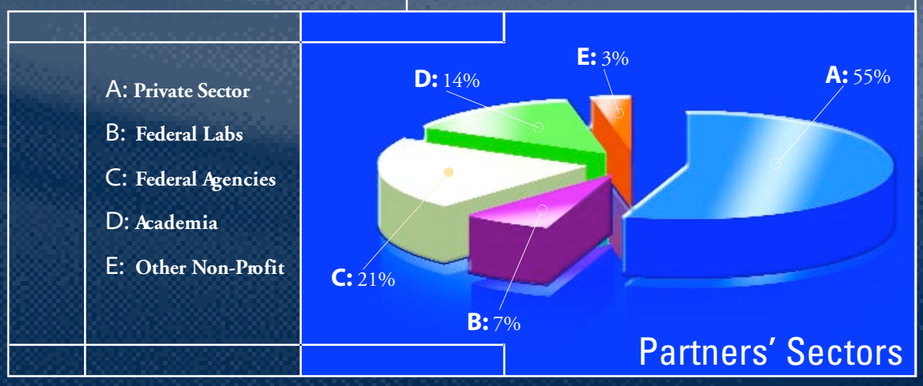


Note: A partnership agreement may have relevance to more than one Mission Directorate.

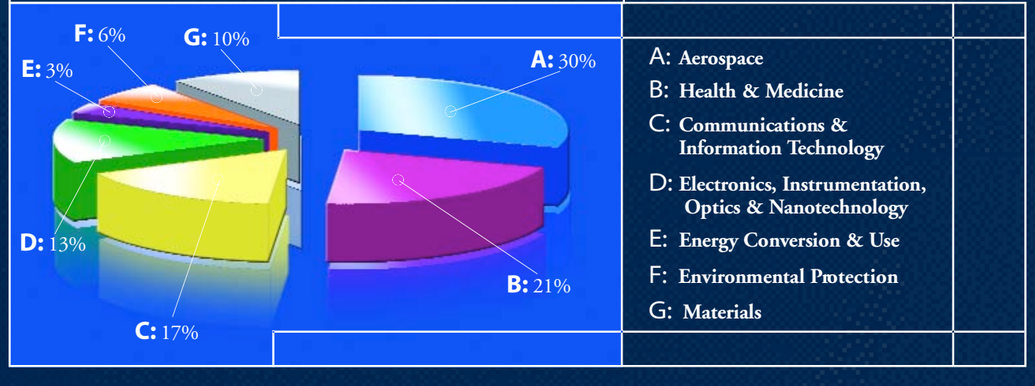
Technology Infusion Partnerships

- 104 technology infusion partnership agreements were signed in FY 2004.
  - — At least 57% of them represent dual-use technology development efforts.
  - — At least 10% of them are for NASA adaptation of existing, commercially available technology.
  - — Reported value brought into NASA: At least $16.6 M, plus unspecified dollar or qualitative value in several other of the 104 partnerships.
  - — Only one of the 104 agreements signed in FY 2004 is associated with NASA's SBIR program. SBIR contributions are therefore in addition to IPP infusion partnership contributions.
  - — 16 of the 104 technology infusion partnership agreements involved partner use of NASA facilities.
- 84 other technology infusion partnership agreements were in negotiations at the end of FY 2004.
- Term of performance completed during FY 2004 for 46 additional technology infusion partnership agreements.
- Partner entities of signed technology infusion agreements represent 25 states.

% OF SIGNED TECHNOLOGY INFUSION PARTNERSHIP AGREEMENTS



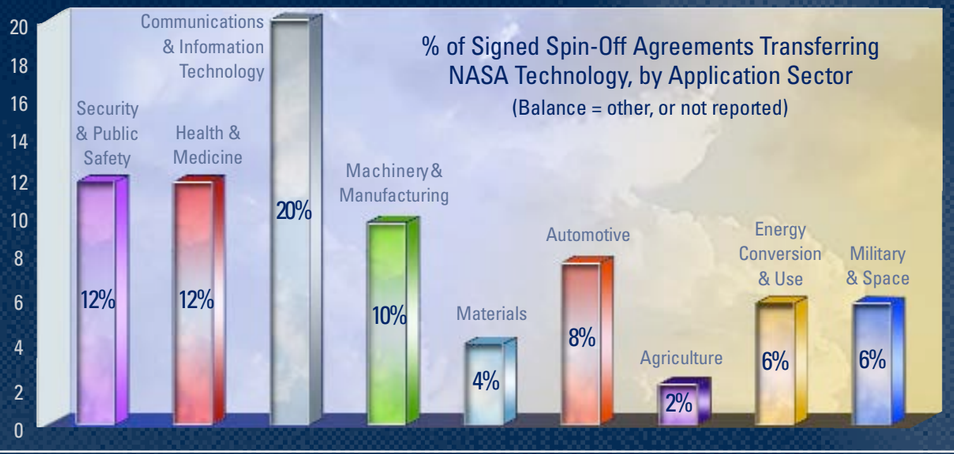
PRIVATE SECTOR PARTNERS' INDUSTRIAL SECTORS (Technology Infusion Agreements)



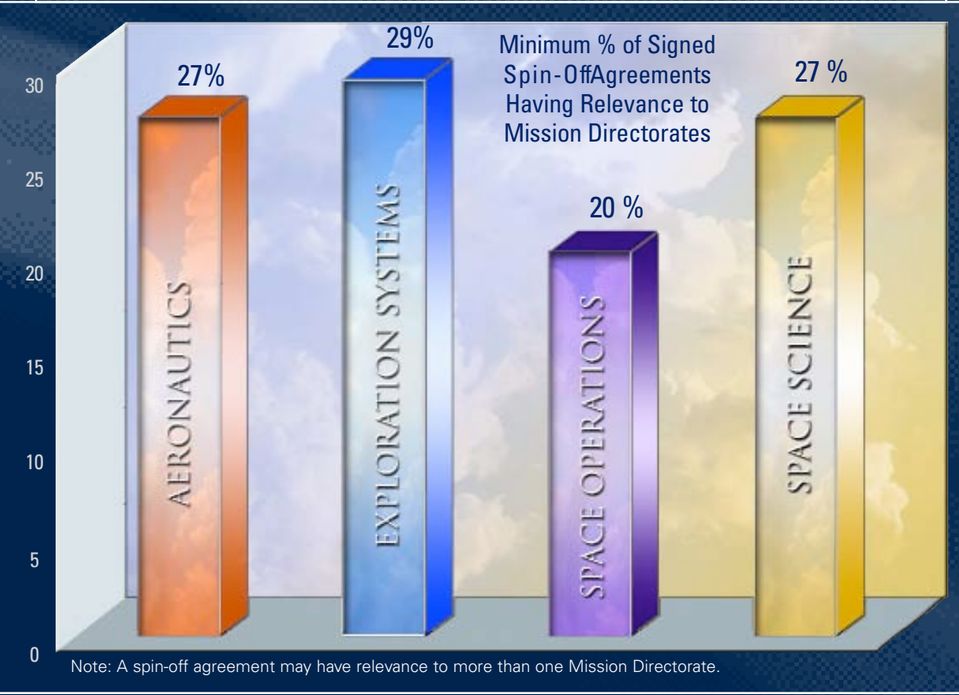
TECHNOLOGY SPIN OUT

The IPP transfers technologies developed by NASA, or developed in partnership with industry or universities, to the private sector for commercial application.

COMMERCIAL APPLICATIONS & QUALITY OF LIFE BENEFITS OF TECHNOLOGIES TRANSFERRED



TECHNOLOGY RELEVANCE TO NASA MISSION DIRECTORATE

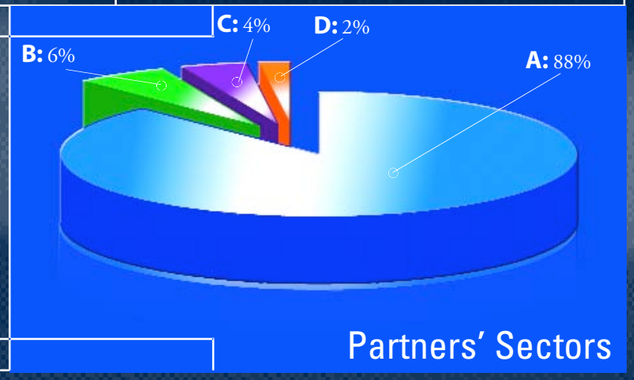


Note: A spin-off agreement may have relevance to more than one Mission Directorate.

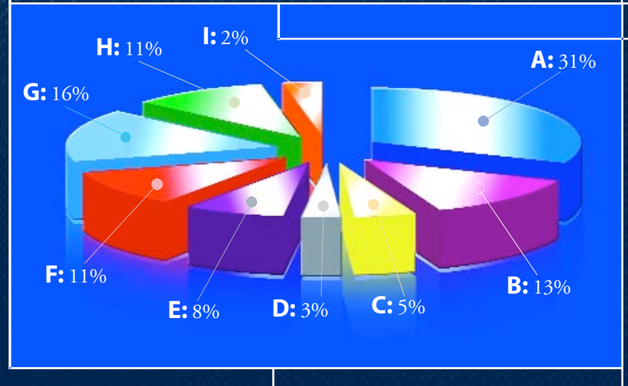
Technology Spin-Off Partnerships

- 51 spin-off partnership agreements were signed in FY 2004.
  - — At least 59% of them provided for licensing of NASA-developed technology.
  - — At least 29% of them were Space Act agreements for other cooperative activities.
- 126 other technology spin-off partnership agreements were in negotiations at end of 2004.
- Term of performance completed during FY 2004 for 15 other technology spin-off partnership agreements.
- Partner entities of signed technology spin-off agreements represent 19 states.

% OF SIGNED SPIN-OFF AGREEMENTS



PRIVATE SECTOR PARTNERS' INDUSTRIAL SECTORS (Spin-Off Agreements)



A: Communications & Information Technology
B: Electronics, Instrumentation, Optics & Nanotechnology
C: Energy Conversion & Use
D: Chemicals
E: Manufacturing
F: Materials
G: Aerospace
H: Health & Medicine
I: Environmental Protection

AFTER

At first glance, Global Positioning System (GPS) technology doesn't appear to have anything in common with a smoke detector, and neither one appears related to a Computerized Axial Tomography (CAT) scan. But these three innovations share one very important element — all are outgrowths of NASA technologies originally developed for the space program.

INNOVATIVE
PARTNERSHIPS
PROGRAM

RESULTS

INNOVATIVE
PARTNERSHIPS
PROGRAM

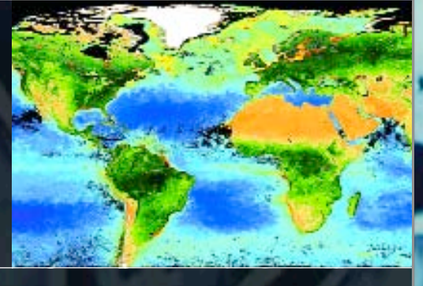
TOOL ENHANCES DISEASE DIAGNOSIS AND PATIENT MONITORING

IPP AT GODDARD SPACE FLIGHT CENTER

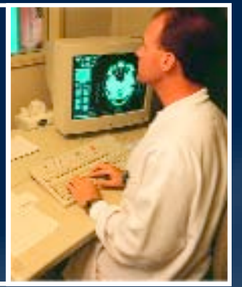
NASA Goddard Space Flight Center developed the Hilbert-Huang Transform (HHT) data analysis tool, which enables previously unavailable analysis of nonlinear and non-stationary data, a difficult problem in science and engineering applications, as well as for NASA missions. The HHT has far-reaching applications, including analysis of earthquake signals, global temperature variations, biomedical data and in structural damage detection.

The HHT is now in use at over 60 universities and government agencies and is currently being evaluated for license by over 40 commercial companies. HHT has been used to determine stability and potential damage from airplane wing fluttering for the F/A-18.

Harvard Medical School is using the HHT to enhance the diagnosis and monitoring of patients at high risk for medical conditions such as sleep apnea, epileptic seizures, stroke, sudden cardiac death and neurological disorders like Parkinson's disease and depression. Also, the Federal Bureau of Investigation has determined that HHT has great potential in speaker recognition analysis.



The HHT data analysis tool can analyze global temperature variations, earthquake signals and biomedical data.



HSEG sysem provides advanced level of detail in images in order to improve diagnosis.

PHOTO CREDIT: NASA

A NEW APPROACH TO IMAGE ANALYSIS

IPP AT GODDARD SPACE FLIGHT CENTER

NASA Goddard Space Flight Center developed the Hierarchical Segmentation (HSEG) software system for use in Earth remote sensing applications. This system provides a new approach to image analysis, which offers selectable levels of detail that increase accuracy for two-dimensional (and potentially three-dimensional) images. The HSEG provides a more reliable and accurate representation of the image. HSEG is broadly applicable to a wide range of applications including monitoring agricultural crops, roadways and traffic congestion; identifying buildings; identifying population densities and areas with greatest population expansion; and analyzing medical images.

In 2002, Goddard issued a nonexclusive license to Bartron Medical Imaging, LLC, which has since developed a product, Med-Seg™, for use in medical imaging. HSEG has enabled analysis and extraction of features from grayscale data previously indistinguishable by the human eye. The University of Connecticut School of Dental Medicine currently uses Meg-Seg™ in this way. Also, preliminary studies indicate the potential for great improvements in diagnosing osteoporosis by utilizing HSEG technology.

HSEG technology is being used successfully in multiple NASA programs, including the NASA IMAGE mission and NASA's Intelligent Systems program.

CREATING A VIRTUAL INTENSIVE CARE UNIT

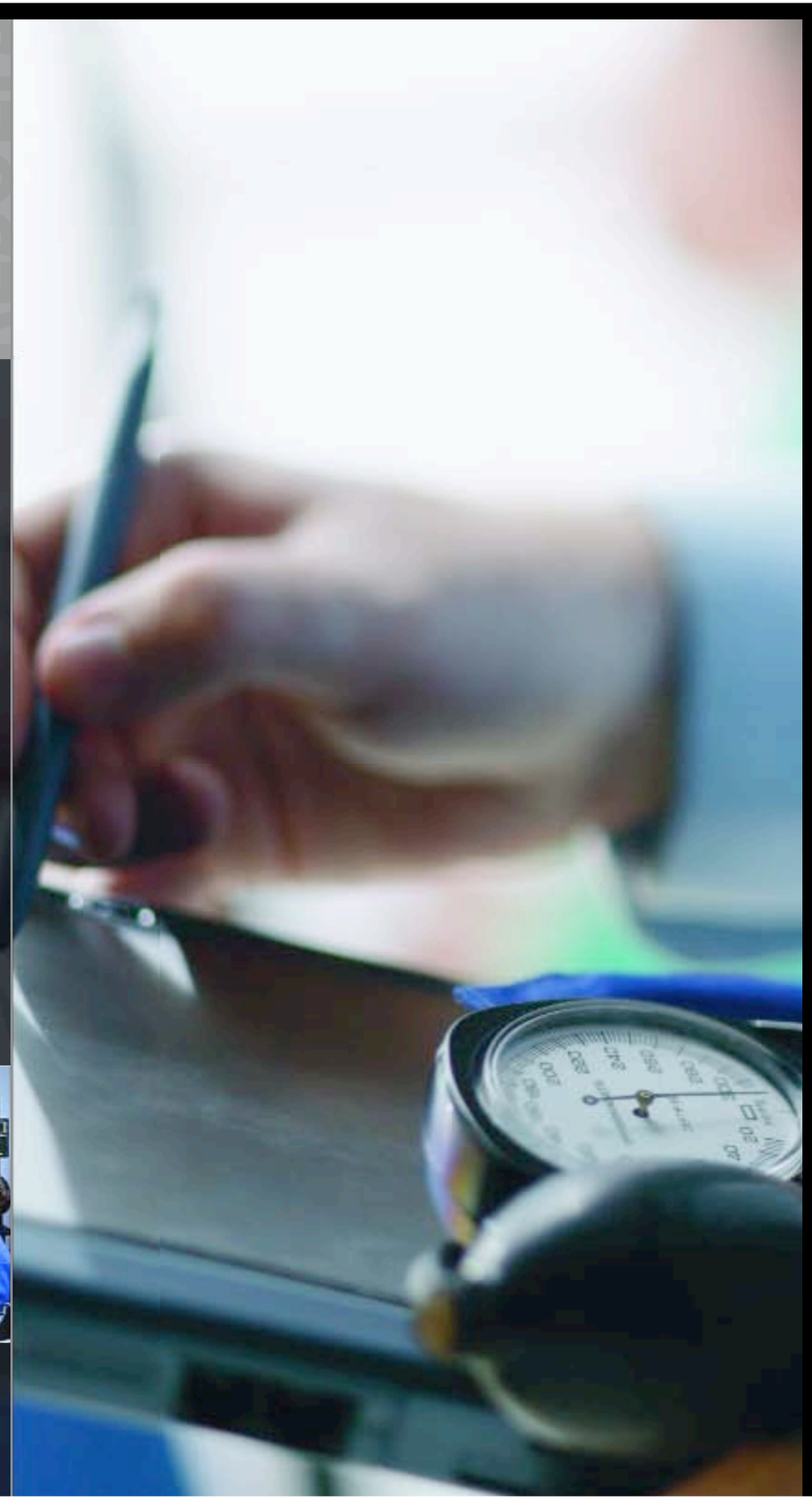
IPP AT THE JET PROPULSION LABORATORY

Computer engineers at the Jet Propulsion Laboratory (JPL) are working with doctors on a computer system that might eventually allow high-tech surgeries to be performed in a remote country using a virtual pediatric intensive care unit. The JPL-created software can connect information from various hospitals all over the world. The system would also link doctors with researchers, enabling them to obtain information about the most advanced treatment for various pediatric diseases. The system is based on software developed for NASA's space science research, and is also utilized to support the Mars Exploration Rovers, which are currently exploring the Martian environment.

The computer system would enable pediatricians to record patient information directly from bedside monitors, regardless of their location. The system is capable of storing this information so researchers can use it for clinical trials, and help educate other doctors dealing with patients having similar health conditions. The JPL-developed technology is ideal for hospitals without advanced intensive care units. Currently, the technology is being tested at Children's Hospital in Los Angeles, CA. In 2005, the system will be extended to Johns Hopkins Children's Center, Baltimore, MD, and Cornell University Medical Center, New York, NY.

The new system can link doctors with the most advanced research and treatment protocols for pediatric diseases.

PHOTO CREDIT: NASA/JPL



PROVIDING SAFER METHODS FOR MEDICAL IMAGING

IPP AT AMES RESEARCH CENTER

NASA Ames Research Center and Salinas Valley Memorial Hospital, Salinas, CA, have signed an agreement to work together to advance the quality, accuracy and utility of medical imaging in humans and other animals. NASA researchers will use their expertise in image processing and 3-D modeling to develop high-fidelity digital models of the anatomy and physiological functions of animals. The hospital will provide NASA scientists with medical data and assist in evaluating the new imaging technology. It is the intent of this collaboration to result in a major breakthrough in the field of diagnostic imaging for medical patients.

Standard medical scanning techniques used today to image internal organs, bones, blood flow and neural function are magnetic resonance imaging (MRI) and computed tomography (CT) scans. MRI is an imaging technique used to produce high-quality images of the inside of the human body. CT is the process of generating a composite image of internal body structures from X-rays taken from different angles. By combining the data from CT, MRI and ultrasound, scientists can better understand cardiovascular anatomy and function without exposing the patient to a potentially harmful environment. Thus, the technology will provide a safer method to study animal and human anatomy without subjecting patients to potential harmful radiation or magnetic fields. NASA's mission interest in this joint agreement is concerned with exposure of astronauts in space to radiation and magnetic fields.

TREATMENT
FOR BONE LOSS STUDIED IN SPACE NOW IN CLINICAL TRIALS

IPP AT THE UNIVERSITY OF COLORADO AT BOULDER

Through research on Space Shuttle flight STS-108, NASA's BioServe Research Partnership Center, located at the University of Colorado at Boulder, and Amgen, Inc. (Thousand Oaks, CA), demonstrated the effectiveness of Osteoprotegerin (OPG), a therapeutic for bone disease, to prevent bone loss that results from the weightlessness of space flight. Amgen discovered OPG in the mid-1990s as part of its genomics drug discovery work, and subsequently developed AMG 162, a drug that mimics OPG. AMG 162 is currently in clinical development for the treatment of osteoporosis and bone erosion associated with metastatic bone cancer. Ground-based collaborations, which capitalized on BioServe's expertise in biomedicine and space research, demonstrated the efficacy of OPG and AMG 162 in disuse models, thus contributing to Amgen's further development of these drugs. Research conducted aboard the Space Shuttle under this partnership demonstrated AMG 162 to be a promising countermeasure for bone loss associated with long-duration human spaceflight. Through this partnership, NASA's search for a solution to a major health risk for astronauts is also contributing to solutions to health problems on Earth.

Research on the Space Shuttle tested a new therapy to prevent the loss of bone density. These X-rays show a normal level of Osteoprotegerin (OPG), which is a physiological regulator of bone density, followed by an excess level of OPG and a low level of OPG.

PHOTO CREDIT: NASA

PHOTO CREDIT: NASA

At this mobile surgical facility, telemedicine technology transmits patients' vital signs from remote Amazon villages to doctors in Virginia.

TELEMEDICINE
BRINGS HEALTH CARE TO REMOTE REGIONS ON EARTH AND IN SPACE

IPP AT VIRGINIA COMMONWEALTH UNIVERSITY

The Medical Informatics and Technology Applications Consortium (MITAC), a NASA Research Partnership Center (RPC) located at Virginia Commonwealth University, has developed telemedicine technology critical to long-term medical care that will be important to astronauts embarking on long-duration space exploration missions. The technology, which includes specialized communications equipment, computers, and cameras, is currently being applied to provide medical care to people in remote locations on Earth. For example, a mobile surgical facility located in Amazon villages of Ecuador, which are only reachable by small planes or canoes, currently utilizes the technology to transmit vital signs of patients to doctors 3,000 miles away at Virginia Commonwealth University. In one such case, an anesthesiologist at the university, monitoring a surgery in Ecuador, noticed a life-threatening irregularity in the patient's heart rhythm. He warned the Ecuadorian surgeons, who responded in time to prevent harm to the patient. Medical students and physicians from across the globe have visited Virginia Commonwealth University, learned about telemedicine, and gone back to their countries to start telemedicine programs.

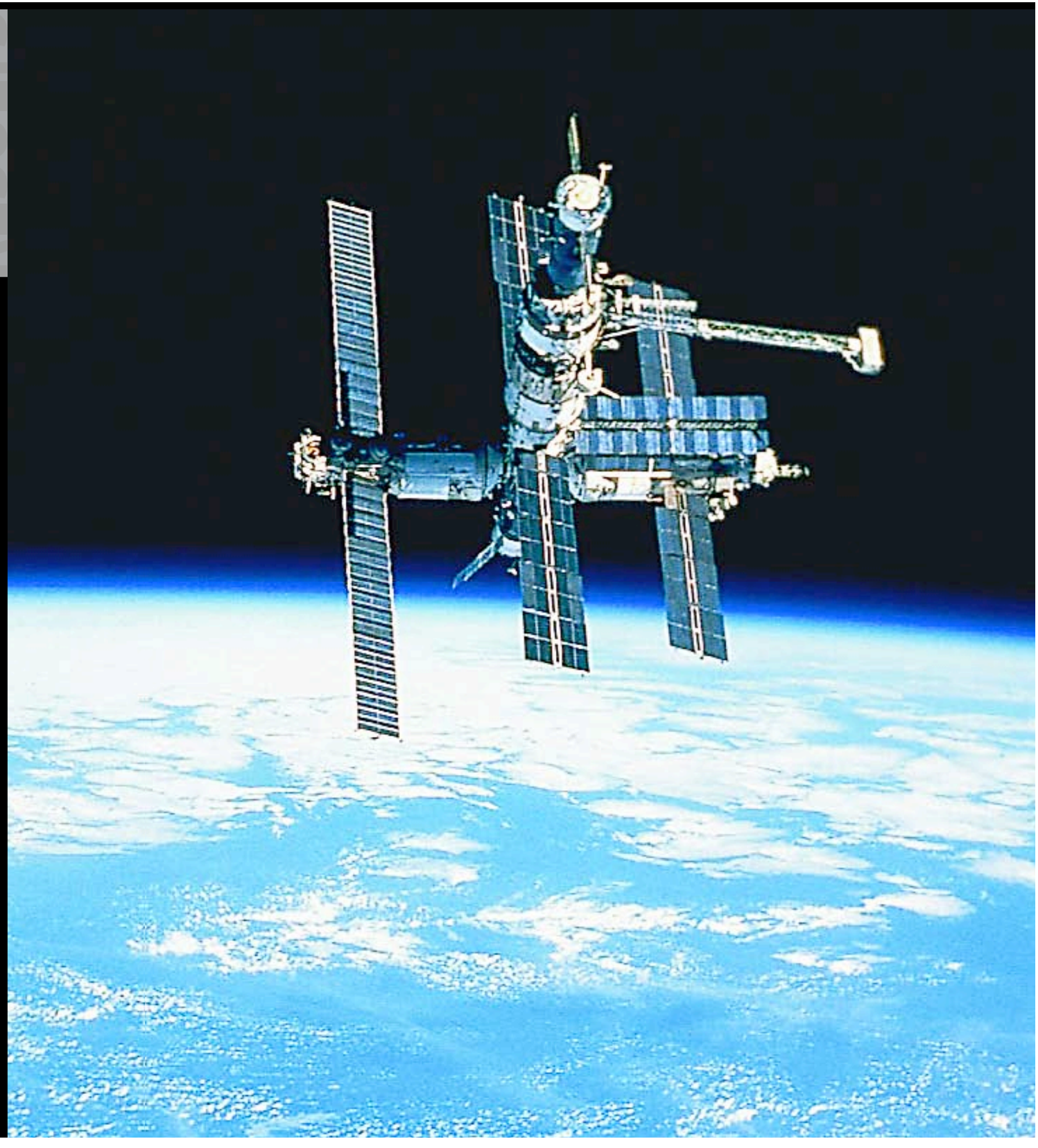
ROTATING BIOREACTOR

HELPS IN GROWING HUMAN TISSUE

IPP AT JOHNSON SPACE CENTER

Understanding the human body and how it reacts in space and on Earth is critical to space exploration. Accordingly, for research purposes, NASA Johnson Space Center (JSC) developed a rotating bioreactor to incubate human cell cultures in a neutral buoyant environment that simulates the weightlessness of space. The bioreactor provides a time varying electromagnetic field imposed on a spinning, fluid-filled vessel that creates an ideal environment to grow human cell tissue on Earth. The bioreactor also provides a medium for better understanding of what makes cells grow. Therefore, the NASA technologies associated with JSC's bioreactor offer the potential for production of living, functional replacement tissue for research and medical applications regarding a variety of human organs.

JSC recently negotiated a license agreement and a joint research partnership with Regenetech, Inc. (Sugar Land, TX) for the purposes of applying JSC's bioreactor and its related technologies to research in cell and tissue regenerative medicine and gene therapy. Regenetech will utilize significant risk capital to research harvesting of adult stem cells from a patient's blood or bone marrow in order to grow them externally, using JSC's bioreactor technologies. The regenerated cells can then be reintroduced to the patient for the purposes of cell and tissue restoration via the blood stream without concern for compatibility complications or negative effects on the immune system. According to Regenetech, the partnership agreements with NASA provide it access to technology that the company could not have afforded itself. The private research that is now made possible by the partnership agreements with JSC holds promise for treatment of a broad spectrum of illnesses, as well as helping burn victims and those suffering devastating effects of chemotherapy.



DETECTING CARCINOGENS AND GAS LEAKS

IPP AT THE JET PROPULSION LABORATORY

Researchers at the Jet Propulsion Laboratory (JPL) developed detection technology having a variety of commercial applications in food safety, homeland security, medical devices, environmental monitoring, and industrial worker health monitoring. The result is the Reversal Electron Attachment Detection (READ) instrument, which combines a patented unique electrostatic optics system with mass spectrometry, resulting in an extremely sensitive instrument with a very high dynamic range. READ technology is the most sensitive method known for measuring the presence of certain important classes of molecules in real time; it performs rapid analyses heretofore not possible.

A new company, FemtoTrace, Inc. (Pomona, CA), under an exclusive license with NASA and California Institute of Technology, is commercializing READ technology in a family of user-friendly devices, which can be deployed as field mobile instruments. A major electric and gas utility company will use these instruments to detect the presence of carcinogenic PCBs, and to find leaks in electrical and gas lines. The technology can also be used for gas leak detection aboard the Space Shuttle and the International Space Station.

A major utility company plans to use the READ instrument to detect carcinogens and to find leaks in electric and gas lines.

EARLY-WARNING SYSTEM ASSISTS COMMUNITY

IPP AT STENNIS SPACE CENTER

One of the fast-growing — but severely flood-prone — areas in the United States is benefiting from an early-warning technology that NASA helped develop.

Several environmental factors combine to make St. Tammany Parish in southeastern Louisiana a target for floods. To reduce the disastrous effects that result, St. Tammany's Emergency Management Operations Center (EMOC) looked to the nearby John C. Stennis Space Center for help. An answer came in the form of a new technology developed through a Dual-Use Development Agreement between the two parties and a small geospatial applications company named NVision.

REACT system integrates information to alert emergency management personnel when flooding threatens.

The technology is REACT – Real-time Emergency Action Coordination Tool, a decision-support system that integrates disparate information and provides emergency management personnel with what they need to take action when flooding threatens. The system collects real-time meteorological data from various sources and combines it with other relevant information about the area, and conducts spatial analysis using the Geographic Information Systems (GIS) database to provide visualization of analytical data. The information is transferred to EMOC's computer system and can alert emergency responders to affected facilities, roads and residents, and suggest evacuation routes.

St. Tammany Parish plans to extend its use of the REACT system into its land-development process as well. REACT also could be useful in supporting a variety of other situations that first responders face, such as fires, hazardous material spills and airborne biochemical agent releases.

NASA supplied remote sensing expertise needed for REACT, and NVision developed the Web-based real-time GIS system.

NVision is headquartered at the Mississippi Enterprise for Technology business incubator at Stennis Space Center and has a satellite office in Slidell, LA.

PURIFYING WATER ON EARTH AND IN SPACE

SMALL BUSINESS INNOVATIVE RESEARCH

UMPQUA Research Company (Myrtle Creek, OR) developed its Microbial Check Valve (MCV®) under NASA's SBIR program. The MCV® is used on all Space Shuttle missions to prevent growth of pathogens in the crew's drinking water supply. As a flow-through canister, the MCV® also provides a disinfectant methodology for third world societies and locations that lack the infrastructure necessary for chlorination. The MCV® is installed in-line with the drinking water flow. No energy is required, and the device is able to perform over a wide range of flow rates. The MCV® has been incorporated into a variety of commercial water purification cartridges for the production of potable water.

PHOTO CREDIT: UMPQUA RESEARCH COMPANY

The Microbial Check Valve ® prevents growth of pathogens in drinking water.

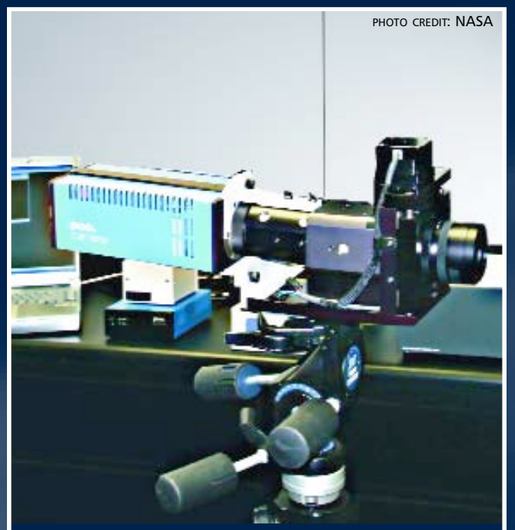


PHOTO CREDIT: NASA

The U.S. Department of Agriculture is using NASA's ultraviolet hyper-spectral sensor in its food and feed safety program.

BIO-PATHOGEN CONTAMINANT DETECTION

IPP AT STENNIS SPACE CENTER

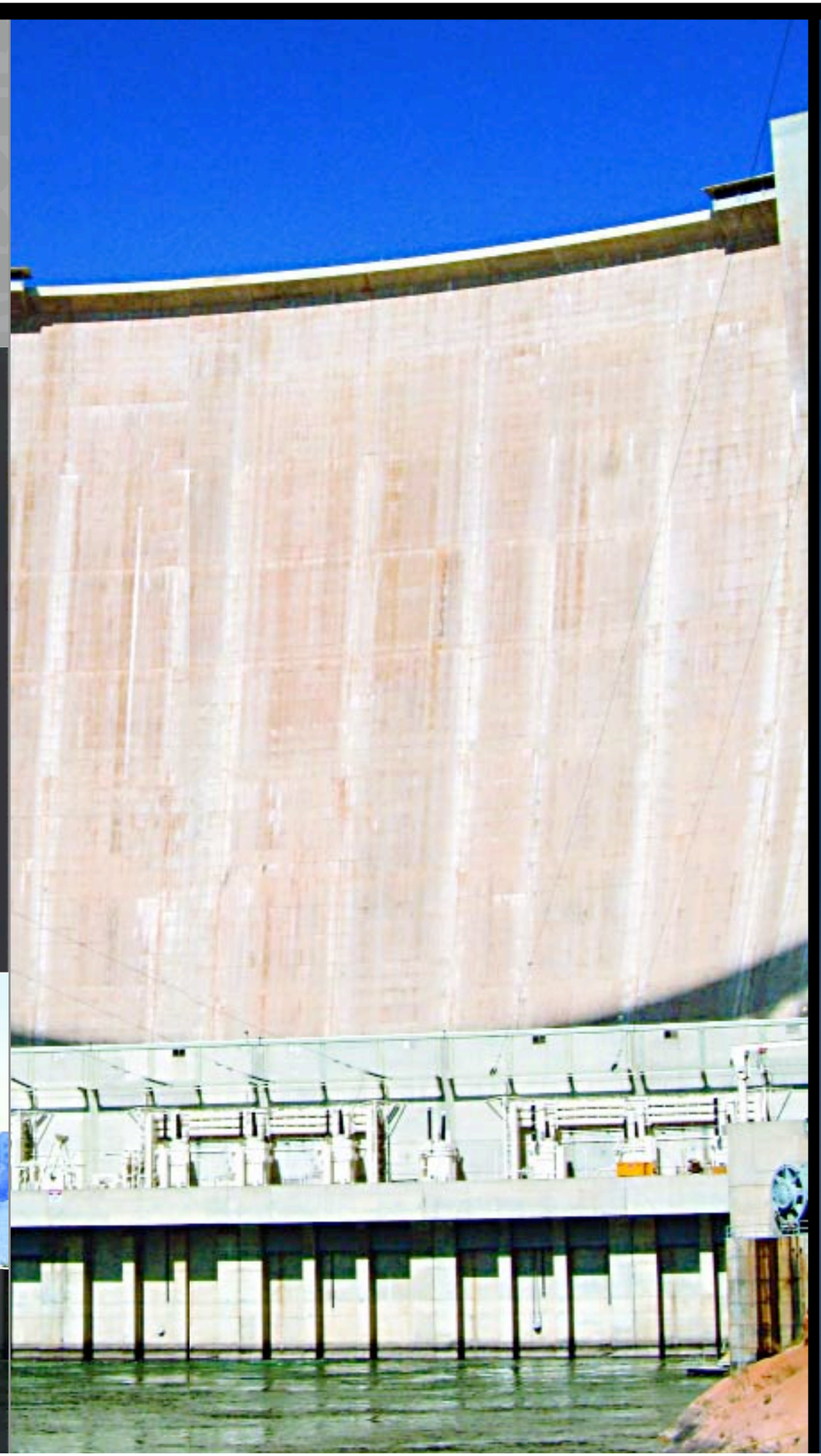
A NASA Research Partnership Center, ProVision Technologies, located at the NASA Stennis Space Center in Mississippi, has developed an ultraviolet hyper-spectral sensor that captures up to 300 spectral bands of light in the range of 200 to 400 nanometers. The technology is a state-of-the-art advancement that is now being used in developing applications for medical imaging, forensics, and bio-pathogen analyses. The system is also being utilized in the U.S. Department of Agriculture's implementing of its dual-use mold and toxin food and feed safety program. The technology also addresses NASA needs regarding bio-pathogen detection in the human habitat environments of long-term spaceflight. The technology has provided the basis for a product line of a new spin-off company, Photon Industries (Stennis Space Center, MS).

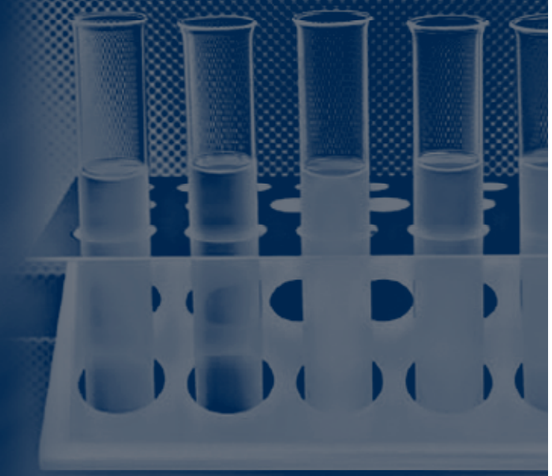
FIBER OPTIC SENSORS AID IN EARLY WARNING

SMALL BUSINESS INNOVATIVE RESEARCH

Intelligent Fiber Optic Systems (IFOS) Corporation (Sunnyvale, CA) has developed its I*Sense™ technology under an SBIR contract with NASA. The resulting IFOS I*Sense™ optical, real-time monitoring and measurement system product line of multisensors has wide commercial application in early warning and detection. For example, the fiber optic sensor system can monitor the maximum allowable strain and stress values at various points of a given structure. Therefore, the technology can be installed in structural members of buildings, bridges, highways, tunnels, ships, dams and petroleum tanks to optimize maintenance scheduling and avoid costly, labor-intensive and less-reliable visual inspection of such structures. It also detects damage to pipelines due to earthquakes or other hazards, and fatigue areas in aircraft structures. The technology also is utilized for manufacturing process control monitoring.

I*Sense™ technology can monitor the maximum allowable strain and stress values at various points in a given structure.





SOL-GEL MATERIAL CONTRIBUTES TO HOMELAND SECURITY

SMALL BUSINESS INNOVATIVE RESEARCH

Advanced Fuel Research, Inc. (East Hartford, CT) has developed sol-gels material under NASA's SBIR program to provide trace chemical analysis by surface-enhanced Raman (SER) spectroscopy for the purposes of continuous water quality monitoring in space life support systems and astronaut health assessment through urine and blood analysis. Vials are coated with the SER-active sol-gel, and a solution containing the chemical of interest is injected into the vial. The resulting spectrum is recorded by any commercial Raman spectrometer, thus allowing identification of numerous chemicals, bio-chemicals and pharmaceuticals. Advantages of this innovative material include requiring virtually no sample preparation, since samples do not have to be pre-mixed, dried or dissolved in specific solvents. All common solvents can be used, including water at pH levels 1 through 10. Commercial applications include detecting and identifying chemical and biological warfare agents, chemical contaminants in groundwater and water supplies, illegal drug particles on surfaces, as well as bio-chemicals that indicate various diseases.

SYSTEM REDUCES INDUSTRIAL POLLUTION, CREATES USEFUL PRODUCTS

IPP AT KENNEDY SPACE CENTER

NASA Kennedy Space Center (KSC) has developed a series of technologies to neutralize waste streams and reduce fuel oxidizer emissions from the Space Shuttle. KSC licensed these technologies to Phoenix Systems International, Inc. (Pinebrook, NJ), and engaged in other agreements with the company to facilitate commercial application of the technologies in lowering nitrous and sulfurous oxides and mercury emissions from fossil fuel combustion sources. The KSC technologies enable separation of emission components into useful products (e.g. fertilizer, which is being tested on orange groves located on the center's grounds), and eliminate hazardous waste streams associated with existing state-of-the-art emission control processes. Existing industrial emission control processes are also very costly. It is these costs that are at the center of current debate over air quality standards and enforcement. A more efficient and less costly pollution control technology is therefore imperative. In the United States alone, more than 448 power plants emit over 4.4 million tons of nitrous oxide into the air annually.

A prototype commercial system based on the KSC technology is currently being tested at the South Carolina Electric and Gas Company Canadys Station. Phoenix Systems' test results demonstrate that the prototype commercial system can achieve 99.5% efficiencies in removing sulfurous oxide, mercury, and hydrogen chloride from industrial emissions. The company has invested millions of dollars for, and is now in the final stages of, development of the KSC technologies into an advanced commercial emission control system that can be applied to improve air quality in the United States and worldwide.

NOx Scrubber Facility at Kennedy Space Center

PHOTO CREDIT: KENNEDY SPACE CENTER

ENHANCED ENVIRONMENTAL MONITORING SYSTEMS

IPP AT AMES RESEARCH CENTER

More than 260 million Americans rely on municipal water systems that are increasingly vulnerable to pathogens and toxins, particularly from bio-terrorist attack. Highly efficient, real-time intelligence and management of water quality is now an imperative. PureSense Environmental, Inc., has entered into a joint research partnership with NASA Ames Research Center to develop emergency-response protocols, software systems, data mining and advanced data analysis to support environmental surveillance and early detection of harmful changes or deliberate contamination of vital resources. With a goal of providing next-generation solutions for water security, the partnership provides PureSense with critical NASA scientific expertise expected to result in more effective solutions and shorter time to market.

NASA mission benefits from the partnership include development of improved real-time series data analysis algorithms and software systems crucial to space science missions, and state-of-the-art automated pattern recognition in large astronomy data sets. In addition, results of this joint effort also could provide a means for detecting potentially harmful aberrations in the quality of water and air for astronaut crews on long-duration Lunar and Mars missions.

Microscale iron emulsion that was pneumatically injected using N_2 gas along a three-foot sand column

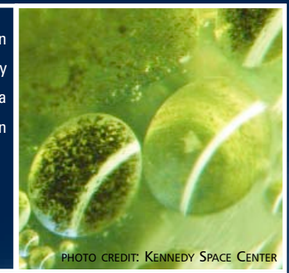


PHOTO CREDIT: KENNEDY SPACE CENTER

TREATING WATER CONTAMINANTS AT THEIR SOURCES

IPP AT KENNEDY SPACE CENTER

Groundwater has been contaminated for decades by DNAPs (Dense Non-Aqueous Phase Liquids) due to inadequate disposal practices, affecting thousands of locations across the United States. However, few technologies exist that can treat DNAPLs in a timely and cost-effective manner. NASA Kennedy Space Center (KSC) has developed an environmental cleanup technology, called Emulsified Zero-Valent Iron (EZVI), that provides an efficient method to neutralize DNAPL sources in groundwater, which left untreated, can contaminate drinking water. EZVI directly treats contaminant sources, requires less treatment time, reduces treatment costs, and produces less-toxic and more-easily degradable by-products than previous state-of-the-art technology. The Environmental Protection Agency reports that DNAPLs are present at 60% to 70% of all sites on its Superfund National Priorities List. Other contaminated sites include locations of dye and paint manufacturers, dry cleaners, chemical manufacturers, metal cleaning and degreasing facilities, leather tanning facilities, pharmaceutical manufacturers, adhesive, and aerosol manufacturers.

KSC has licensed its EZVI technology to companies in the hazardous waste and groundwater remediation industry. Specifically, KSC has licensed the technology to Weston Solutions, Inc. (West Chester, PA), Toxicological & Environmental Associates, Inc. (TEA) (Baton Rouge, LA), and GeoSyntec Consultants (Boca Raton, FL). TEA is utilizing the technology in Louisiana, Florida, and Texas in environmental cleanup projects in areas that had been damaging to human health. GeoSyntec is making this KSC technology available to clients across North America, Europe, and Australia.

INNOVATIVE PARTNERSHIPS PROGRAM

CREATING NEXT-GENERATION TURBOMACHINERY

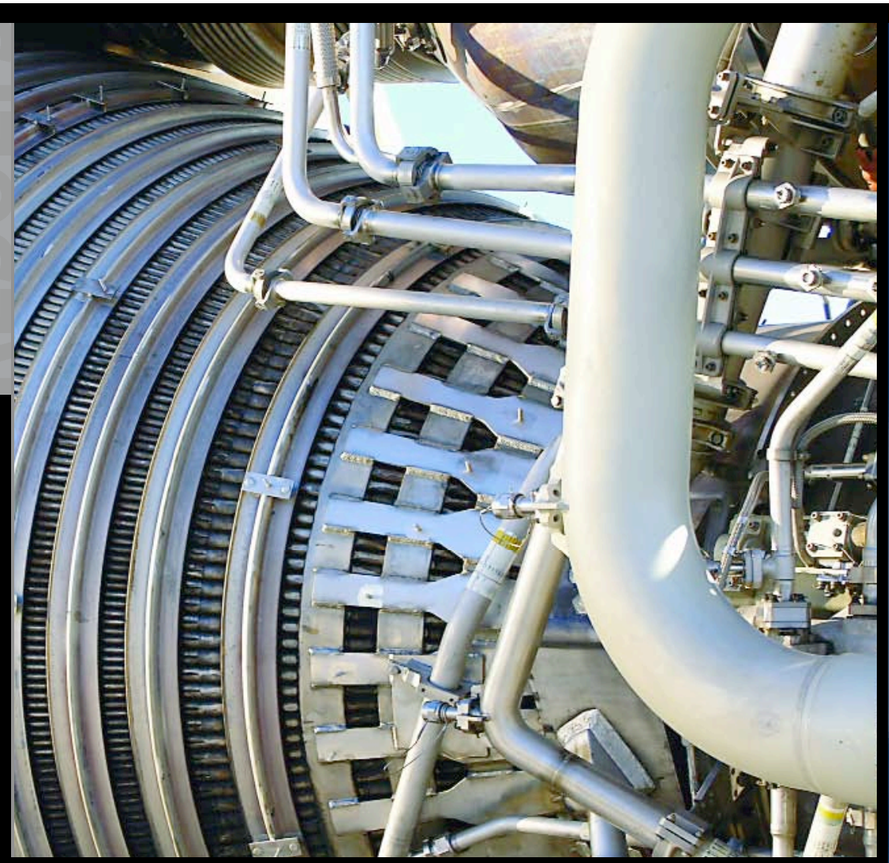
IPP AT GLENN RESEARCH CENTER

Turbomachinery is an industrial keystone. Excellent function can ensure smooth operations, but downtime can have enormous negative impact on profitability in a broad range of industries. Because highly efficient and reliable turbomachinery is just as critical to the nation's space program, NASA Glenn Research Center (GRC) has entered into partnerships with industry for the purposes of creating next-generation turbomachinery. Under the partnership arrangements, GRC is developing high-temperature oil-free bearings, seals and solid lubricants essential to improved efficiency, lower friction and reduced emissions that would characterize next-generation turbomachinery. Commercial applications of the technology would include advanced aero-propulsion engines, refrigeration compressors, turbochargers and hybrid electrical turbogenerators.

As examples of GRC's research success in this area to date, Elliott Turbomachinery Company (Jeannette, PA), a global designer and manufacturer of industrial gas compressors, steam turbines and power recovery turbines, has applied GRC's solid lubricant technology in its commercial steam turbines. After one year of operation, Elliott has found virtually no galling or wear and has noticed reduced maintenance and repair costs. ADMA Products, Inc. (Twinsburg, Ohio) has licensed GRC's solid lubricant technology to make its machine parts products more robust. Lincoln Electric Co. (Cleveland, OH), designers, developers, and manufacturers of arc welding products, robotic welding systems and plasma and oxyfuel cutting equipment, found that the resulting solid lubricated bearings purchased from ADMA exhibited superior reliability leading to manufacturing cost savings for the company of over $200,000 annually.

PM304 BUSHINGS

PHOTO CREDIT: GLENN RESEARCH CENTER



ADHESIVE IMPROVES PIEZOELECTRIC ACTUATORS AND SENSORS

IPP AT LANGLEY RESEARCH CENTER

In 2004, Face International Corp. (Norfolk, VA) began selling revolutionary piezoelectric actuators, which incorporate adhesive technology developed by NASA Langley Research Center (LaRC) and licensed by the company from NASA. The superior bonding strength of the NASA- developed adhesive enables ferroelectric devices, made up of wafer-like layers of material bonded together, to have exceptional ruggedness and performance capability. Piezoelectric bend when an electrical charge is applied to them, and conversely produce an electrical charge when mechanical pressure is applied to them. The exceptionally strong bond provided by the NASA material allows Face's piezoelectric devices to bend to a far greater extent without cracking, thus representing a significant advancement in the durability and range of performance of piezoelectric actuators and sensors.

Actuators are commercially applied in everyday products such as motors, valves, switches, air-flow control, pumps, compressors, humidifiers, and electro-optic scanning. Sensors are utilized in a great variety of commercial applications such as detection of motion, pressure, position, force, and shock, as well as in non-destructive evaluation of structures.

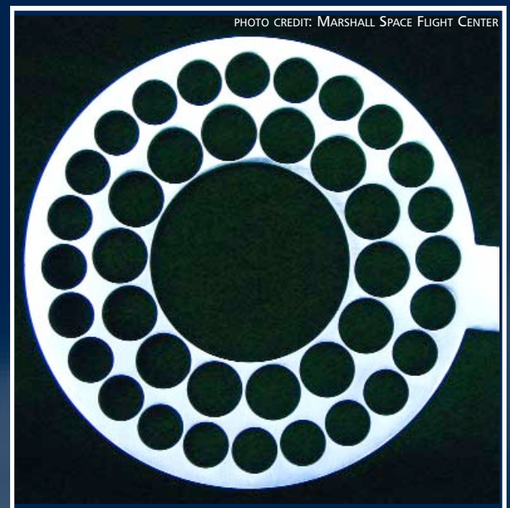


PHOTO CREDIT: MARSHALL SPACE FLIGHT CENTER

Device provides highly accurate flow rate metering, flow limiting or flow conditioning.

BALANCED FLOW METER IMPROVES ANY FLUID FLOW SYSTEM

IPP AT MARSHAL SPACE FLIGHT CENTER

NASA Marshall Space Flight Center (MSFC), in partnership with Quality Monitoring and Control (QMC) (Kingwood, TX), has developed state-of-the-art flow meter technology. The resulting Balanced Flow Meter provides highly accurate flow rate metering, flow limiting, or flow conditioning in piping, channel, and conduits of any fluid flow system. As a flow meter, the technology offers a 50% increase in pressure recovery, a 10-fold increase in accuracy, and a 15-to-1 reduction in acoustic noise generation relative to competing technologies. As a flow-limiting device, the technology provides accurate flow limiting for safety and process control systems, with lower cost and space requirements relative to competing technologies. As a flow-conditioning device, the technology has the capability of improving process and equipment performance by conditioning fluid flow and fluid energy profiles around elbows, combustion chambers, and pump inlets.

Fluid flow measurements are used extensively for industrial processes in the petroleum refinery, chemical, power, and pharmaceutical industries. The Balanced Flow Meter also has numerous applications to NASA's liquid propulsion systems and test facilities. Based on its work with NASA, QMC founded A+FlowTek, also of Kingwood, TX, to commercialize the balanced flow meter technology.

HIGH-STRENGTH WEAR-RESISTANT ALUMINUM ALLOY

IPP AT MARSHALL SPACE FLIGHT CENTER

NASA has recently licensed a novel aluminum alloy technology to the Bombardier Motor Corporation of America (Melbourne, FL). NASA Marshall Space Flight Center researchers developed the new, high-strength alloy for high-temperature applications (450 to 600 degrees F), typical of internal combustion engines. Bombardier is utilizing the alloy to produce marine outboard engine pistons. The company has introduced the alloy into its 115- to 250-horsepower engines, and plans to utilize the alloy in its other engine product lines in the near future.

The NASA aluminum alloy could enable automotive and other engine manufacturers to make more-durable engines that produce more horsepower at lighter weights, while emitting fewer pollutants. The NASA alloy is an enabling technology for a new breed of high-performance pistons and engine blocks, as well as turbochargers, impellers, brake calipers, and rotors.

Pistons are among the many products that will benefit from the new aluminum alloy.

PHOTO CREDIT: BIGELOW AEROSPACE

Two full-scale steel demonstrators, each 45 X 22 feet, are connected together at Bigelow Aerospace's North Las Vegas facility.

INFLATABLE STRUCTURES COULD PROVIDE HABITATS ON MOON AND MARS

IPP AT JOHNSON SPACE CENTER

NASA Johnson Space Center (JSC) has signed an exclusive licensing agreement with Bigelow Aerospace (Las Vegas, NV) concerning inflatable space structures technology originally developed by NASA as part of earlier designs for the International Space Station. The recent license agreement is one of a series of agreements signed by JSC with Bigelow regarding inflatable structure technology. Bigelow plans to deploy a man-tended commercial inflatable module, independent of the International Space Station, in the 2008-2010 time frame. The company is targeting new commercial markets, and also sees NASA and the Department of Defense as potential customers. Bigelow believes that inflatable module technology could also provide habitats on the moon, and perhaps Mars.

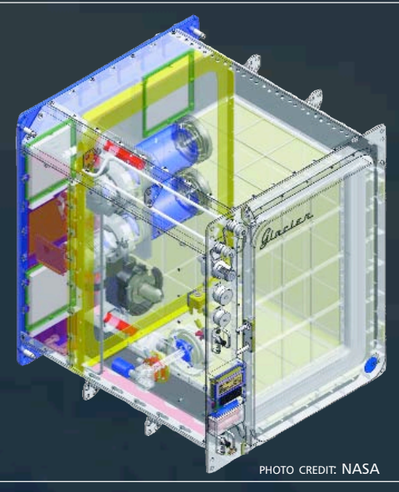
The Bigelow venture currently involves more than two dozen established aerospace subcontractors and nearly 60 full-time Bigelow employees. Several tens of millions of dollars in private capital have already been invested in the venture. The company is currently well into the development of 25% and 45% scale inflatable flight test modules, planned for privately funded unmanned orbital test flights in the 2005-2007 time frame. The company has already developed full- and reduced-scale inflatable ground test hardware. Once inflated in orbit, the module would measure 45 X 22 feet with 330 cubic meters of volume, substantially bigger than any individual Space Station module.

REFRIGERATOR SYSTEM SUPPORTS RESEARCH IN SPACE

IPP AT THE UNIVERSITY OF ALABAMA, BIRMINGHAM

The Center for Biophysical Sciences and Engineering (CBSE), a NASA Research Partnership Center located at the University of Alabama, Birmingham (UAB), has been selected to design, build and deliver for flight GLACIER, a cryogenic refrigerator system. The purpose of the GLACIER system is to support scientific research on the International Space Station (ISS) by providing a versatile cryogenic freezing and storage unit onboard the ISS to preserve a broad range of scientific samples. GLACIER is also used to transport samples to and from the ISS.

The CBSE GLACIER project represents a better way of doing business—combining the unique strengths of NASA, the university, and industry. This partnership is meeting NASA needs by delivering critical, advanced and highly reliable scientific equipment rapidly and at low cost. GLACIER will support biological, biomedical and other scientific research that will enable humans to live and work in space for long periods of time.



GLACIER provides cryogenic freezing and storage on board the International Space Station.

PHOTO CREDIT: NASA

PHOTO CREDIT: GLENN RESEARCH CENTER

Rod-coil co-polymer could replace electrolyte materials currently used in lithium batteries.

ENHANCING LITHIUM BATTERIES

IPP AT GLENN RESEARCH CENTER

Batterypower has many space-related applications, including planetary orbiters, landers, rovers, space suits and portable tools. Increased battery power is crucial to continued NASA success in research and exploration. Lithium batteries offer four to five times the power of commercially available batteries, but at five times the cost, due to the expense and complexity of electrolyte materials. Accordingly, NASA Glenn Research Center (GRC) has developed a solid "rod-coil" co-polymer material that would replace current electrolyte materials in batteries. The result has been significantly reduced manufacturing costs of high-performance lithium batteries. In addition, the GRC-developed material could enable the creation of more-reliable power systems for space exploration, lowered launch costs, and increased mission duration.

To economize on budget resources and avail itself of complementary capabilities of industry, GRC has entered into partnerships with Eveready Battery Company (Cleveland, OH) and the Ferro Corporation (Cleveland, OH) for necessary further development of its co-polymer electrolyte material. GRC and Eveready are working jointly to incorporate the polymer material into a viable, enhanced lithium battery design. Eveready can prototype new battery designs more quickly than GRC can, accelerating development of a new lithium battery for space applications.

Ferro Corporation, a leading producer of performance materials for a wide variety of industries, is collaborating with NASA to develop a process to produce the rod-coil electrolyte material. Through this partnership, Ferro will be able to produce rod-coil samples in larger sizes, at higher quality and at lower cost than NASA could.

The results of this partnership are critical to NASA's further development of the rod-coil material, and to incorporating the material into space programs requiring advanced battery capability.

INNOVATIVE PARTNERSHIPS PROGRAM

ICE THICKNESS MEASUREMENT DEVICE CONSERVES ENERGY

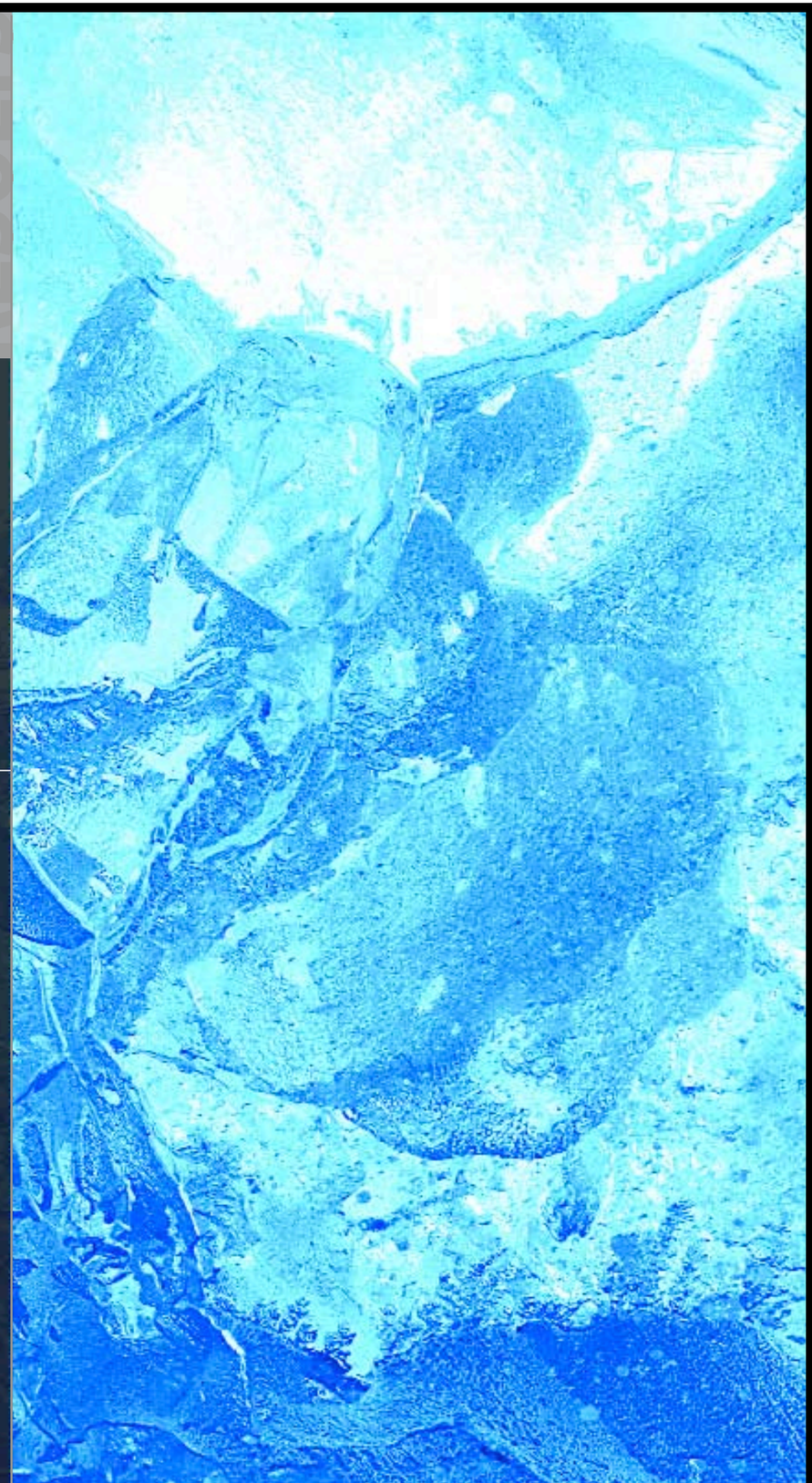
IPP AT LANGLEY RESEARCH CENTER

NASA Langley Research Center (LaRC) recently licensed ice thickness measurement technology, developed by LaRC researchers, to First Technology (Plymouth, MI). The company plans to apply the LaRC technology to commercial and residential refrigeration frost and ice detection. The technology provides continuous feedback regarding ice conditions, which provides the flexibility for defrosting upon demand. This helps to conserve energy. First Technology's products incorporating the LaRC technology are anticipated to be commercially available in about one year.

INNOVATIVE BATTERY TECHNOLOGY HAS WIDE APPLICATION

SMALL BUSINESS INNOVATIVE RESEARCH

Yardney Technical Products, Inc. (Pawcatuck, CT) has developed high-energy density rechargeable 20 ampere-hour lithium-ion batteries for space applications under NASA SBIR contracts. The batteries provide weight and volume savings of three to four times that of competing technologies. The innovative battery technology has wide commercial application in medical electronics, medical implants, cameras, robotics and pipeline inspection. The firm's NASA SBIR contracts have resulted in its winning a follow-on $13.6 million joint contract with NASA and the U.S. Air Force for battery development for aircraft, Mars planetary rovers, planetary landers and satellite applications.



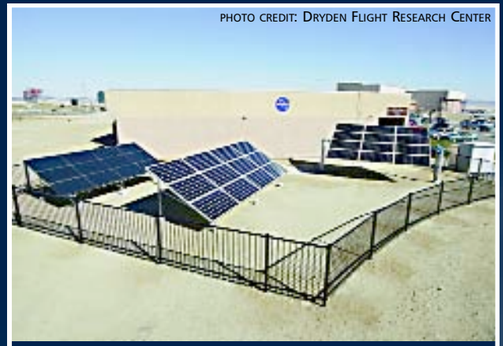


PHOTO CREDIT: DRYDEN FLIGHT RESEARCH CENTER

THE 5KW, STATE-OF-THE-ART SOLAR DEMONSTRATION SITE AT NASA DRYDEN IS VALIDATING EARTHLY USE OF SOLAR CELLS DEVELOPED FOR NASA'S HELIOS SOLAR-ELECTRIC AIRCRAFT

INCREASING THE EFFICIENCY OF SOLAR ARRAYS

IPP AT DRYDEN FLIGHT RESEARCH CENTER

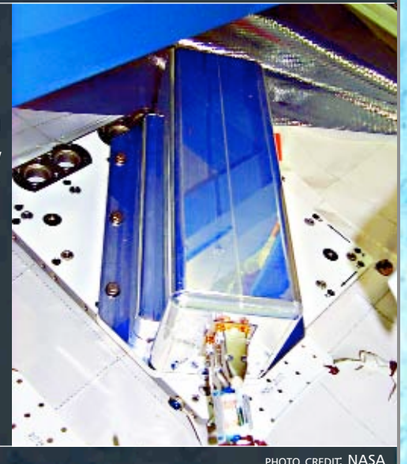
NASA's state-of-the-art solar panel array demonstration site at Dryden Flight Research Center (DFRC) represents the latest in high-efficiency solar cell technology for use on Earth. The silicon cells utilized are derived from NASA's Environmental Research Aircraft and Sensor Technology (ERAST) program, and are the most advanced photovoltaic cells in existence. Typical commercial grade solar cells are from 12% to 15% efficient, whereas NASA's solar cells are 20% efficient. The efficiency improvement is due largely to the routing of cell electrical connections required by the ERAST program. In addition, a real-time solar tracking tilt capability allows DFRC's solar cell arrays to follow the sun. The demonstration solar array system is currently providing power to some facilities at DFRC.

NASA is also studying the relative advantage of real-time solar tracking arrays over fixed arrays, the effect of dust and dirt on solar arrays, as well as the effectiveness of dirt-repellant coating over the protective glass housing the solar cells. If the DFRC demonstration is successful, it can lead to commercial mass production of these highly efficient solar cell arrays for residential, business, and government applications. DFRC's long-term plans include construction of a solar farm at the Center that would provide about one-third of its power needs.

STARNAV I
ADVANCED STAR TRACKER
HAS SCIENTIFIC AND MILITARY APPLICATIONS

IPP AT TEXAS A&M UNIVERSITY

An advanced star tracker that may lead to improved performance of military satellites and space exploration missions was successfully tested by the Space Technology Center (STC) on the Space Shuttle mission, STS-107, in January 2003. STC is a NASA Research Partnership Center, located at Texas A&M University. The RPC designed, built, and flight qualified StarNav I space hardware in collaboration with NASA and its member firms. Under the collaboration, StarNav I was mounted in the Space Shuttle's cargo bay in a flight test to validate a new algorithm for determining precise spacecraft attitude without prior knowledge of position, and to demonstrate proprietary opto-mechanical design concepts that would reduce the cost and mass of commercial star trackers. This collaborative work has produced unique, dual field-of-view technology that out-performs the current approach for high-accuracy pointing. The technology can enable satellites to point antennas and sensors with high precision at a lower cost, thus enhancing their performance for homeland security and exploration of the moon, Mars and beyond.



StarNav I may lead to improved performance of military satellites and space exploration missions.

PHOTO CREDIT: NASA

A new NASA - Xerox partnership will advance NASA's Space Exploration Mission and provide software solutions to the commercial sector.

INNOVATIVE INFORMATION MANAGEMENT SOLUTIONS

IPP AT AMES RESEARCH CENTER

NASA Ames Research Center (ARC) and Xerox Corporation (Stamford, CT) have formed an innovative technology partnership under which they are collaborating to advance the state of the art in information management systems. The collaborative effort will provide new tools and applications critical to the Vision for Space Exploration. In addition, the joint effort will benefit NASA scientists and affiliates, as well as the commercial sector, by providing software solutions to large-scale problems in information management. NASA ARC licensed the core technology to Xerox in April 2004.

The partnership has already produced a new system, the NX Knowledge Network, which is being used by various mission and project teams at ARC to quickly manage, sort, and analyze enormous quantities of data. NX also will have applications in project risk management, mishap investigations, and analysis of anomalies. The collaborative effort combines cutting-edge software technology from both NASA and Xerox to provide NASA with powerful new tools, tailored to its missions, in a very cost-effective way.

MONITORING PLANT HEALTH: FROM AGRICULTURE TO ATHLETIC TURF

IPP AT STENNIS SPACE CENTER

The CM 1000 chlorophyll meter is a product of a non-exclusive license agreement between NASA and Spectrum Technologies, Inc., of Plainfield, IL. The hand-held meter determines a plant's stress, water and nutrient deficiencies as well as insect and disease damage. The user simply points the device at a plant and pulls a trigger, and in a matter of seconds the results appear.

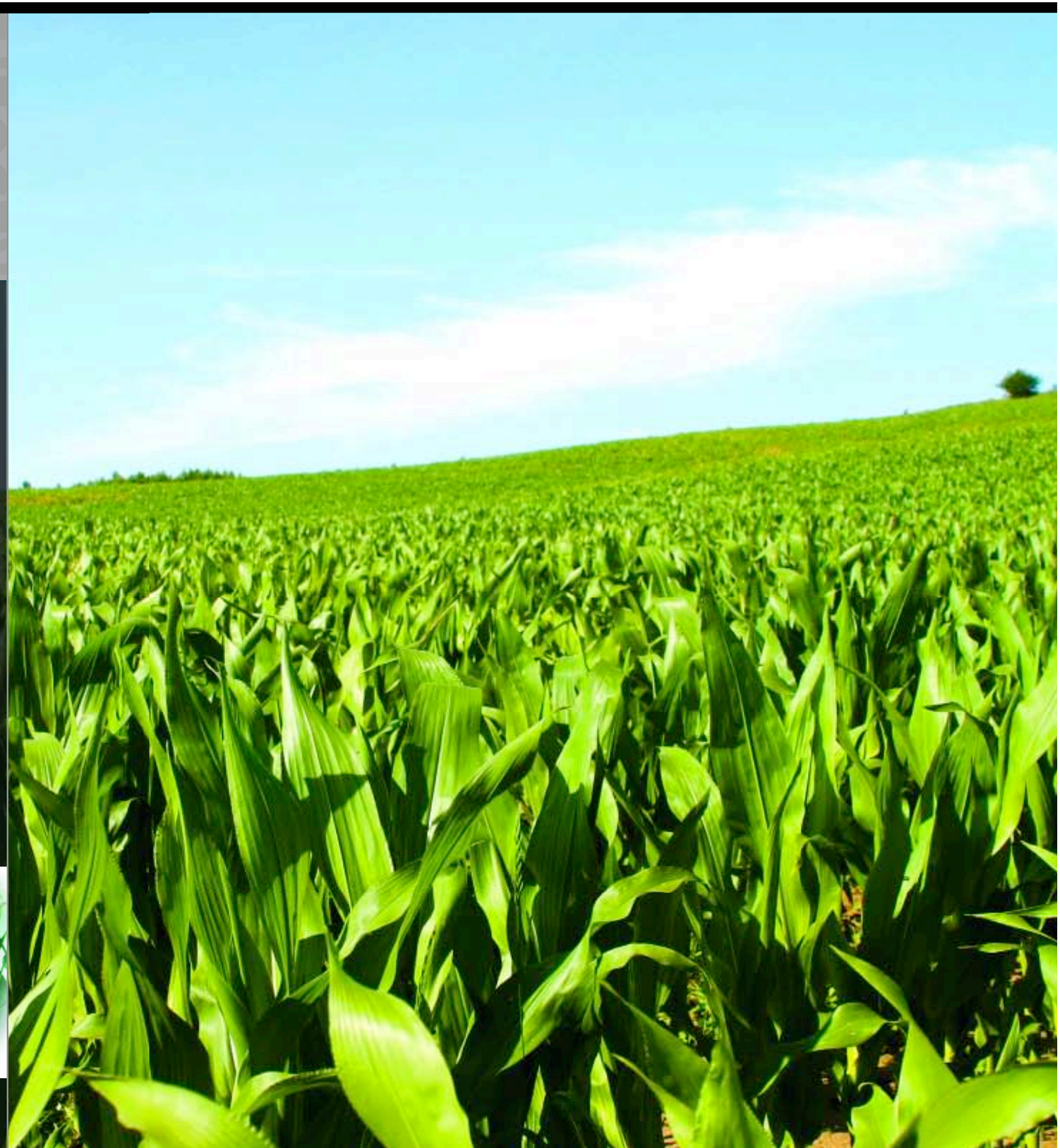
Previous technologies that tested a plant's health were expensive, needed a link to a computer and required days of data processing for results.

Scientists at NASA John C. Stennis Space Center developed a prototype device that could determine chlorophyll level quickly and accurately by measuring the reflectance of a plant leaf at a specific waveband. Spectrum enhanced the NASA prototype, which led to the purchase of two units by Stennis.

To date, the CM 1000 has been used mainly by researchers for nitrogen analysis in cotton and potato crops. However, Spectrum is awaiting publication of results from testing use of the device on turf grass. The company expects the results to open up the market to monitoring the health and quality of turf grass on sporting fields and golf courses. Other possible uses for the CM 1000 include management of nitrogen, a fertilizer nutrient that can taint groundwater if not monitored carefully.

The CM 1000 chlorophyll meter determines a plant's health status in seconds.

PHOTO CREDIT: NASA



IPP IS DEDICATED TO STRENGTHENING OUR NATION'S ECONOMY AND IMPROVING QUALITY OF LIFE

Technology Transfer

Everyday items like GPS technology, CAT scans and smoke detectors are among the many examples of technology transfer – NASA's inventions, innovations and discoveries that are developed for use in the Agency's programs and later go on to become commercial products. The results of technology transfer have impacted virtually all U.S. industries. In the process, NASA's technology transfer has improved the quality of life in the U.S. and strengthened our nation's economy. Now that's return on investment – something of which all Americans can be proud.

Providing that critical link between these original NASA innovations and the resulting commercial products is the Agency's Innovative Partnerships Program (IPP), through its Technology Transfer Element.

GPS technology

Drawing on a network of technology transfer offices at NASA Field Centers and other organizations all across the country, the IPP transfers technologies developed by NASA, or developed in partnership with industry or universities, to the private sector for commercial application. Conversely, these agents also seek out solutions in industry, academia, and other government labs to meet NASA's technology needs, saving the Agency millions of dollars in R&D.

In both cases, known as "spin out" and "spin in" or "infusion," respectively, the IPP is creating joint technology research ventures between NASA and the private sector. These partnerships are implemented through licenses, and Space Act and other agreements, with the goals of benefiting NASA, strengthening U.S. economic competitiveness and improving the quality of life for all Americans.

In fiscal year 2004, the IPP facilitated more than 155 partnerships between NASA and the private and other sectors, yielding technologies that can lead to improvements in health care, manufacturing, communications, and environmental safety.

The IPP network of agents and affiliates is key to forming these partnerships. They maintain expert-level intelligence and provide the outreach that is critical to locating potential partner entities, to building relationships and, finally, to producing agreements that are mutually beneficial.

As part of NASA's plan to carry out the Vision for Space Exploration, the Agency created the Exploration Systems Mission Directorate (ESMD), and organizationally the IPP is now located within ESMD. While the IPP supports all of NASA's Mission Directorates or business units, it places special emphasis on serving the mission needs of exploration. As NASA commits itself to carrying out the Vision, the IPP is increasing its efforts to partner with industry and academia to "spin in" the technologies needed especially for space exploration, and to "spin out" those developed by NASA.

The successes brought forth through technology transfer in 2004 will translate into millions of dollars in savings for NASA, in addition to numerous other benefits to the nation and to mankind, confirming the IPP as a value-added program whose importance to the Agency will only increase as the Vision for Space Exploration unfolds.

The IPP provides that critical link between original NASA innovations and the resulting commercial products.

Research Partnership Centers

The IPP's Research Partnership Centers (RPCs) engage in research partnerships among an extensive network of industrial firms, academia, NASA Field Centers, and other federal government agencies for the purposes of generating knowledge and creating technologies for NASA and other federal government mission use, where the technologies also have appreciable likelihood of commercial applicability. The prospect of commercial applicability is central to the private sector's willingness to contribute resources to the collaborations. The network of private entities involved includes several small businesses, as well as many of the largest research and development companies in the world. RPCs offer their partner entities world-class research expertise and scientific facilities, the opportunity to collaborate and share knowledge, as well as access to NASA's terrestrial and space-based facilities. Located at universities or non-profit institutions throughout the country, each of the 12 RPCs focuses on a specific discipline, such as spacecraft technology, satellite communication, space power, biotechnology and advanced materials.

The RPCs and their member entities are producing new technologies that will benefit NASA and that can create economic activity and improve life on Earth. Examples of these technologies include an advanced, low-cost star tracker that produces highly accurate and reliable attitude determination; an anthrax-killing device developed from technology used to grow plants on the International Space Station; a hyper-spectral imaging system that is used to identify molds and toxins in food supplies, and in the detection of forensic materials; a mobile surgical unit used to perform pre-surgical diagnostic screenings on patients in remote locations; and the successful demonstration of the effectiveness of Osteoprotegerin, a therapy for bone disease and cancer, for the prevention of bone loss resulting from the weightlessness of space flight.

SBIR/STTR Programs

The IPP also includes NASA's Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs. The primary purpose of these programs is to provide the opportunity for the small business sector to provide technologies and basic research in support of NASA missions. A secondary purpose is to encourage application of NASA SBIR/STTR technologies for commercial and quality-of-life-benefit to the nation. The STTR program differs from the SBIR program in that it is a much smaller program, it focuses on early technology development and it requires the small business entity to partner with a non-profit research institution, such as a university. IPP manages these programs such that they are strongly aligned with NASA's technology needs. Results thus far show that more than two dollars in commercial revenues generated in non-government markets is associated with each dollar of NASA investment in its SBIR program.

University Research, Engineering, and Technology Institutes (URETIs)

NASA established the University Research, Engineering, and Technology Institutes (URETIs) program to strengthen its linkage with the academic community, particularly in technical disciplines critical to the Vision for Space Exploration mission as well as in aeronautics. The program's purposes include NASA's accessing cutting-edge technical know-how and facilities residing in academia, as well as inspiring the nation's youth to consider careers in science and engineering and at NASA. The URETIs program is an element of the IPP. In 2002, four IPP URETIs were established, each focused on a key research area of NASA. Each of these four partnerships represents a collaborative cluster of universities and NASA Field Centers, with one particular university designated as the lead entity. The four lead universities, and their respective program research emphasis, are:

- Princeton University (multifunctional nano materials)
- Purdue University (nano electronics and computing)
- Texas A&M (intelligent bio-nano materials)
- University of California at Los Angeles (bio informatics, nano technologies)

Other URETI program member universities are: Arizona State University, California Institute of Technology, University of California-Irvine, University of California-Santa Barbara, University of California-San Diego, Yale University, Northwestern University, Cornell University, University of North Carolina, Prairie View A & M, Rice University, Texas Southern University, University of Houston, University of Texas-Arlington and University of Florida.

Invention Disclosure and Patenting

	FY2004
New inventions disclosed in the FY[1]	**687**
Patent applications filed in the FY[2]	**154**
Patents issued in the FY	**157**

(1) Inventions by NASA Civil Se rvants and JPL employees.
(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-partapplications. Excludes: provisional, continuation, duplicate foreign, and PCT applications.
Note: Additional inventions disclosed by NASA Contractors/Grantees that include NASA Civil Se rvant employee co-inventors: FY 2004 (247).

Profile of Active Licenses

	FY2004
All licenses, total number active in the FY[1]	**701**
• New, executed in the FY	94
Invention licenses, total active in the FY	**345**
• New, executed in the FY	90
Patent licenses,[2] total active in FY	**310**
• New, executed in the FY	56
Material transfer (inventions), total active in FY	
• New, executed in the FY	
Other invention licenses, total active in FY	**43**
• New, executed in the FY	
Other IP licenses, total active in the FY	**356**
• New, executed in the FY	334
Copyright licenses (fee bearing)	**69**
• New, executed in the FY	4
Material transfer (non-inv.), total active in FY	
• New, executed in the FY	
Other [3]	**329**
• New, executed in the FY	329

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights (i.e., hybrid licenses) are re ported as patent licenses -- and not included in the count of copyright licenses.
(1) "Active" = legally in force at any time during the FY.
(2) Patent license tally includes patent applications that are licensed.
(3) Releases for Open Channel web licenses
-- = Data not requested from agency in previous year's reports.

All income be aring licenses, number	**233**
• Exclusive	102
• Pa rtially exclusive	26
• Non-exclusive	105
Invention licenses, income bearing	**226**
• Exclusive	99
• Pa rtially exclusive	26
• Non-exclusive	101
Patent licenses,[1] income bearing	**187**
• Exclusive	92
• Pa rtially exclusive	26
• Non-exclusive	69
Other IP licenses, income bearing	**49**
• Exclusive	10
• Pa rtially exclusive	0
• Non-exclusive	36
Copyright licenses (fee bearing)	**46**
• Exclusive	10
• Pa rtially exclusive	0
• Non-exlusive	36
All royalty-bearing licenses,[2] number	**129**
— Invention licenses, royalty-bearing, number	**111**
• Patent licenses,[1] royalty-bearing	111

Profile of Active Licenses (cont.)

— Other IP licenses, royalty-bearing	**18**
• Copyright licenses (fee-bearing)	18

Note: In general, license income can result from various sources: license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recove ry of goods and services provided by the lab to the licensee including patent costs.
(1) Patent license tally includes patent applications that are licensed.
(2) Note that royalties are one component of total license income.

Licensing Management

	FY2004 months
Elapsed execution time,[1] licenses granted in FY	
— Invention licenses	
• average (or median)	9.4
— Patent licenses[2]	
• average (or median)	9.5
Number of licenses terminated for cause in FY	
— Invention licenses	**14**
— Patent licenses[2]	**12**

(1) Date of license application to the date of license execution. (Date of license application is the date the lab formally acknowledges the written request for a license from a prospective licensee and agrees to enter into negotiations.)
(2) Patent license tally includes patent applications that are licensed.

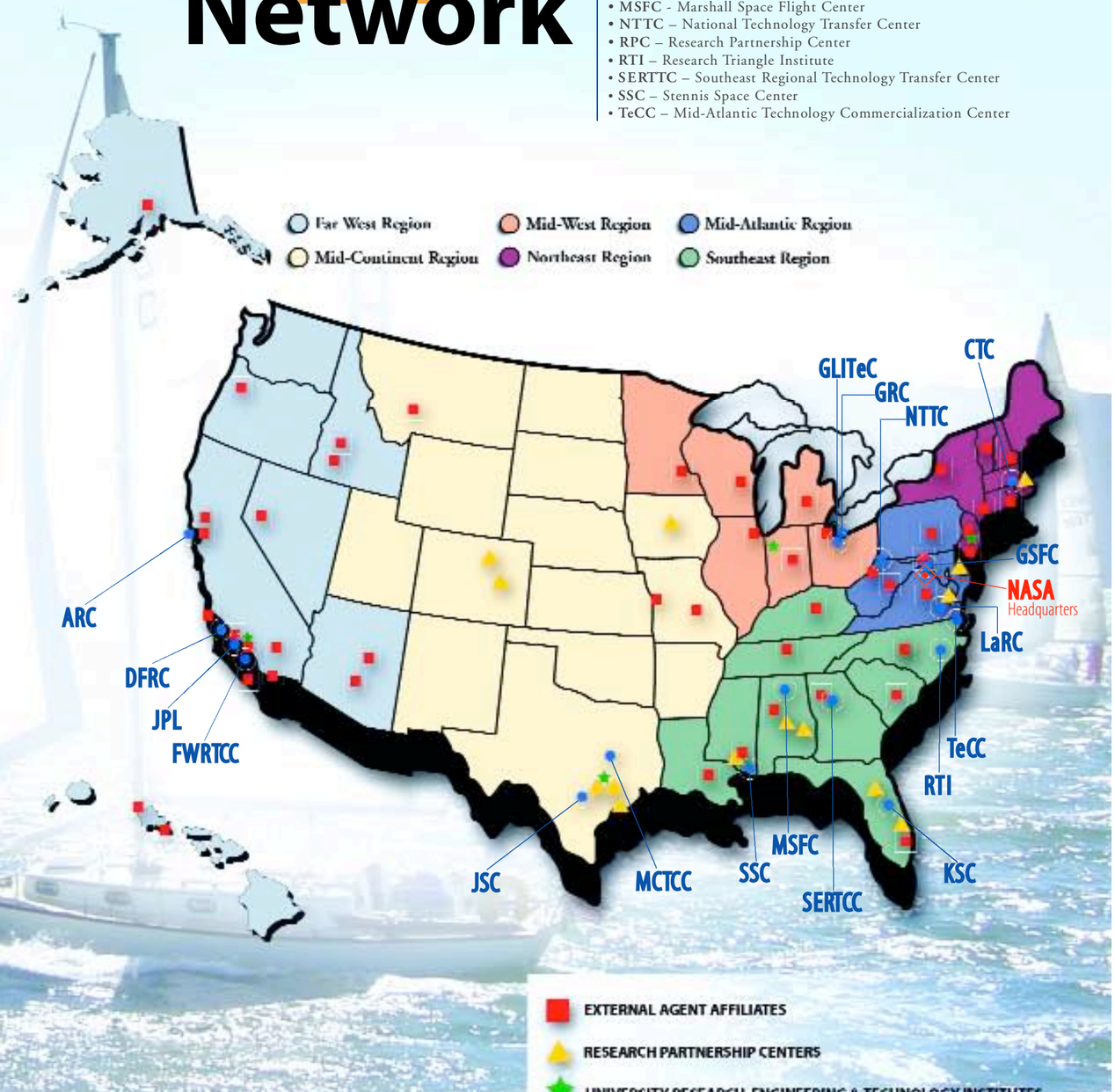
License Income

	FY2004
Total income, all licenses active in FY[1]	**$3,243,234**
— Invention licenses	**$3,069,397**
• Patent licenses[2]	$3,069,397
— Other IP licenses, total active in the FY	**$173,837**
• Copyright licenses	$173,837
Total Earned Royalty Income (ERI)[3]	**$282,139**
• Median ERI	$7,610
• ERI from top 5% of licenses	$53,725
• ERI from top 20% of licenses	$178,722
Invention licenses	**$274,761**
• Median ERI	$9,170
• ERI from top 5% of licenses	$53,725
• ERI from top 20% of licenses	$178,722
Patent licenses[2]	**$274,761**
• Median ERI	$9,170
• ERI from top 5% of licenses	$53,725
• ERI from top 20% of licenses	$178,722
Other IP licenses	**$7,378**
• Median ERI	$3,689
• ERI from top 5% of licenses	N/A
• ERI from top 20% of licenses	N/A
Copyright licenses	**$7,378**
• Median ERI	$3,689
• ERI from top 5% of licenses	N/A
• ERI from top 20% of licenses	N/A

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.
(2) Patent license tally includes patent applications that are licensed.
(3) "Earned royalty" = royalty based upon use of a licensed invention (usually a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.
N/A = Data not available from agency at time of this report.

NASA'S IPP Network

- ARC – Ames Research Center
- CTC – Center for Technology Commercialization
- FWRTTC – Far West Regional Technology Transfer Center
- DFRC – Dryden Flight Research Center
- GLITeC – Great Lakes Industrial Technology Center
- GRC – Glenn Research Center
- GSFC – Goddard Space Flight Center
- JPL – Jet Propulsion Laboratory
- JSC – Johnson Space Center
- KSC – Kennedy Space Center
- LaRC – Langley Research Center
- MCTTC – Mid-Continent Technology Transfer Center
- MSFC - Marshall Space Flight Center
- NTTC – National Technology Transfer Center
- RPC – Research Partnership Center
- RTI – Research Triangle Institute
- SERTTC – Southeast Regional Technology Transfer Center
- SSC – Stennis Space Center
- TeCC – Mid-Atlantic Technology Commercialization Center



IPP ACTIVITIES:
A SAMPLING OF
INNOVATIVE PARTNERSHIPS PROGRAM'S
REACH INTO LOCAL COMMUNITIES
NATIONWIDE

• **ARC** – Ames Research Center • **CTC** – Center for Technology Commercialization • **DFRC** – Dryden Flight Research Center • **FWRTTC** – Far West Regional Technology Transfer Center • **GLITeC** – Great Lakes Industrial Technology Center • **GRC** – Glenn Research Center • **GSFC** – Goddard Space Flight Center • **JPL** – Jet Propulsion Laboratory • **JSC** – Johnson Space Center • **KSC** – Kennedy Space Center • **LaRC** – Langley Research Center • **MCTTC** – Mid-Continent Technology Transfer Center • **MSFC** - Marshall Space Flight Center • **NTTC** – National Technology Transfer Center • **RPC** – Research Partnership Center • **RTI** – Research Triangle Institute• **SERTTC** – Southeast Regional Technology Transfer Center • **SSC** – Stennis Space Center • **TeCC** – Mid-Atlantic Technology Commercialization Center

FY 2004

Alabama

External Agent Affiliate:

• Auburn University MEP (Auburn, AL); (SERTTC).

NASA Research Partnership Center at the University of Alabama, Birmingham, re: biophysical sciences & engineering.

• NASA Research Partnership Center at Auburn University, re: space power & advanced electronics.

Engagement of Alabama non-profit organizations:

• MSFC dual-use development agreement signed with Madison County (AL).

• MSFC license agreement signed with University of Alabama, Huntsville (AL) re: metallic materials technology; (RTI).

• MSFC dual-use development agreement signed with the University of Alabama re: electronics technology.

Engagement of Alabama companies:

• ARC partnership agreement signed with Aero Thermo Technology re: materials technology.

• KSC license agreement signed with Intergraph Solutions Group re: computing technology; (SERTTC, RTI).

• MSFC dual-use development agreement signed with AMCOM.

• MSFC signed two dual-use development agreements with Integrated Concepts and Research Corporation, re: electronic technologies.

• MSFC dual-use development agreement signed with KT Engineering re: space systems risk reduction.

Alaska

External Agent Affiliate:

• Alaska SBDC/TREND (Anchorage, AK); (FWRTTC).

Engagement of Alaskan non-profit organizations:

• Initiated discussions with Alaska government officials regarding a plan to promote partnerships between NASA and Alaska companies; (FWRTTC).

Arizona

External Agent Affiliate:

• Arizona Technology Incubator (Scottsdale, AZ); (FWRTTC).

• Pinnacle Management Group (Scottsdale, AZ); (FWRTTC).

California

External Agent:

• Far West Technology Transfer Center at the University of Southern California (Los Angeles, CA); (FWRTTC).

External Agent Affiliates:

• California Space Authority (Santa Maria, CA); (FWRTTC).

• Center for Applied Competitive Technologies (Sunnyvale, CA); (FWRTTC).

• Digital Coast Roundtable (Los Angeles, CA); (FWRTTC).

• East County Economic Development Council (El Cajon, CA); (FWRTTC).

• IEtechSOURCE (Riverside, CA); (FWRTTC).

• Los Angeles Regional Technology Alliance (Los Angeles, CA); (FWRTTC).

• Pasadena Entretec (Pasadena, CA); (FWRTTC).

• San Diego Center for Applied Competitive Technologies (San Diego, CA); (FWRTTC).

• San Diego Regional Technology Alliance (San Diego, CA); (FWRTTC).

Engagement of California non-profit organizations:

• ARC discussions with Lawrence Livermore Labs re: infusion of ultrasonic/laser drill technology for breaching concrete; (NTTC).

• ARC dual-use development agreement signed with Stanford University, re: geological surveying technologies.

• ARC dual-use development signed with California State University – Hayward.

• ARC dual-use development agreement signed with Salinas Valley Memorial Hospital, re: image-processing technologies.

• ARC partnership agreement signed with California Institute of Technology re: computing technologies.

• ARC dual-use partnership agreement signed with UAV Collaborative re: UAV technology.

• ARC dual-use development agreement signed with Lawrence Berkeley Laboratories re: detector material technologies.

• ARC partnership agreement signed with California Highway Patrol, Golden Gate Division re: helicopter base operations.

• ARC dual-use agreement signed with Stanford University re: aeronautics technology.

• JSC dual-use development agreement signed with University of California – Los Angeles, re: biotechnology.

• JSC dual-use development agreement signed with University of California – Los Angeles re: biotechnology concerning new vaccine development.

• MSFC dual-use development agreement signed with The Boeing Company re: communications hardware technology.

• Board Membership in California Association for Local Economic Development; (FWRTTC).

• Discussions with California Association for Local Economic Development to acquaint business community with NASA's technology transfer mission; (FWRTTC).

• Board Membership in Digital Coast Roundtable of Southern California; (FWRTTC).

• Discussions with members of the Digital Coast Roundtable of Southern California re: opportunities for partnering with JPL in support of NASA's educational outreach efforts; (FWRTTC).

• Participation in the Bakersfield, CA Business Conference; (FWRTTC).

• Board Membership in California Space Authority; (FWRTTC).

• Collaboration with California Space Authority to promote opportunities for infusion of technology into NASA from California companies; (FWRTTC).

• Collaboration with East County Economic Development Council (San Diego) to promote opportunities for infusion of technology into NASA from California companies; (FWRTTC).

Engagement of California companies:

• ARC dual-use development agreement signed with IBM Almaden Research Center, re: information technology.

• ARC dual-use development agreement signed with the Institute of Electrical Education.

• ARC dual-use development agreement signed with B4HI Inc., re: communications and electronics technologies.

• ARC dual-use development agreements signed with Clontech Laboratories, re: medical technology.

• ARC dual-use development agreement signed with Dynamic Research, Inc., re: human factors technologies.

• ARC partnership agreement signed with Hewlett-Packard, re: computing networking and information systems technologies.

• ARC Space Act agreements(2) signed with Ion America Corp. re: energy conversion technologies.

• ARC dual-use development agreement signed with MacuSight Inc., re: biomedical research.

• ARC dual-use development agreement signed with NanoMatrix, Inc., re: nanotechnology and materials technology.

• ARC dual-use development agreement signed with Molecular Nanosystems, Inc., re: nanotechnology.

• ARC dual-use development agreement signed with Northrop Grumman re: aeronautics technology.

• ARC signed two dual-use development agreements with PureSense Environmental Inc., re: environmental technology.

• ARC partnership agreement signed with Raytheon Missile Systems Company, re: aviation technology.

• ARC partnership agreement signed with Reality Capture Tech, Inc., re: software technologies.

• ARC partnership agreement signed with Verio, Inc. re: communications technology.

• ARC dual-use development agreement signed with SpaceDev, Inc., re: space transportation technologies.

• ARC partnership agreement signed with X-Ray Technologies, Inc. re: electronics technologies.

• DFRC engagement of several Kern County businesses regarding partnership opportunities with NASA.

• GRC Space Act agreement signed with Ultramet Corp. (Pacoima, CA), re: propulsion technologies.

• KSC partnership agreement signed with Pacific Instruments, Inc. re: adaptation of commercial electronics technologies for NASA mission use.

• KSC dual-use development agreement signed with Pacific Instruments, Inc., re: adaptation of existing commercial electronics technology.

• LaRC dual-use development agreement signed with Lockheed Martin re: propulsion technology.

• MSFC dual-use development agreement signed with Boeing re: communications technology.

• MSFC dual-use development agreement signed with Boeing, re: aeronautics technologies.

Colorado

External Agent Affiliates:

• Joe Breddan & Associates (Boulder, CO); (MCTTC).

• NASA Research Partnership Center at the University of Colorado, re: biotechnology.

• NASA Research Partnership Center at the Colorado School of Mines, re: combustion technology.

Engagement of Colorado non-profit entities:

• Discussions regarding partnering opportunities with the Center for Commercial Applications of Combustion in Space (a NASA RPC) regarding commercialization of advanced materials; (MCTTC).

• Discussions regarding partnering opportunities with BioServe (a NASA RPC), particularly concerning effectiveness of antibiotics in space; (MCTTC).

• Discussions with University of Colorado Health Sciences Center regarding collaborative R&D efforts with JSC; (MCTTC)

• Discussions with Colorado State University (CSU) regarding collaborative R&D efforts with JSC; (MCTTC).

Engagement of Colorado companies:

• ARC partnership agreement signed with Level 3 Communications re: communications technology.

• GRC Space Act agreement signed with MicroSat Systems, Inc., re: energy conversion technologies.

Connecticut

External Agent Affiliate:

• CTC-Connecticut/Metro NY (Weston, CT); (CTC).

Engagement of Connecticut companies:

• ARC partnership agreement signed with Gartner, Inc.

• GSFC license agreement signed with Bartron Medical Imaging, re: image-processing technology; (RTI).

• GRC Space Act agreement signed with United Technologies, re: aeronautics technologies.

• KSC signed three license agreements with Bartron Medical Imaging re: image processing software; (CTC, SERTTC, RTI).

• JPL industrial partnership signed with FemtoTrace, re: READ technology; (CTC).

Delaware

External Agent Affiliate:

• Delaware SBDC at the University of Delaware; (TeCC).

Engagement of Delaware non-profit entities:

• Discussions with the University City Science Center; (TeCC).

• Discussions with the Digital Delaware technology networking group; (TeCC).

• Central Delaware Economic Development Council; (TeCC).

Florida

External Agent Affiliate:

• Florida Atlantic University; (SERTTC).

• NASA Research Partnership Center at the University of Florida, re: environmental systems technology.

• NASA Research Partnership Center at Florida Atlantic University, re: imaging technology.

Engagement of Florida non-profit entities:

• ARC partnership agreement signed with The Institute for Human and Machine Cognition, re: computing technologies.

• SSC cooperative agreement signed with Florida Agriculture Statistics Service re: improved efficiency for Florida Citrus Production Forecasts.

• SSC cooperative agreement with University of Florida, Institute for Agricultural Systems re: assistance with the advancement of citrus yield estimating system.

Engagement of Florida companies:

• ARC partnership agreement signed with The Institute for Human and Machine Cognition re: computing technologies.

• KSC license agreement signed with Schaffer Test Products, Inc. re: sensor technologies.

• KSC license agreement signed with Zeus Technologies re: computing technology; (RTI).

• KSC license agreement signed with Geosyntec Consultants, Inc. re: groundwater cleanup technology.

• MSFC dual-use development agreement signed with Keystone Strategic Enterprises, Inc. re: materials technologies; (SERTTC).

• SSC cooperative agreement with Florida Citrus Commission representing 11,000 citrus growers re: development of precision agriculture tools to improve citrus growing.

Georgia

External Agent:

• Southern Regional Technology Transfer Center at the Georgia Institute of Technology (Atlanta, GA); (SERTTC).

Engagement of Georgia non-profit entities:

• Discussions with Carpet and Rug Institute re: MSFC technology; (SERTTC).

Engagement of Georgia companies:

• GSFC license agreement signed with Titus Group, LLC, re: materials technology.

• KSC license agreement signed with Nivis, LLC re: electronics technology; (SERTTC, RTI).

• Global Technology Connection signed a Garrett Morgan Commercialization Initiative agreement with NASA GRC; (GLITeC).

Hawaii

External Agent Affiliate:

• University of Hawaii Office of Technology Transfer and Economic Development (Honolulu, HI); (FWRTTC).

• Hawaii Technology Trade Association (Honolulu, HI); (FWRTTC).

Idaho

External Agent Affiliates:

• Idaho Department of Commerce (Boise, ID); (FWRTTC).

• Idaho Small Business Development Center (Boise, ID); (FWRTTC).

Illinois

External Agent Affiliate:

• Illinois Coalition (Chicago, IL); (GLITEC).

Engagement of Illinois non-profit entities:

• MSFC dual-use development agreement signed with the University of Illinois at Urbana re: computer simulation technology.

Engagement of Illinois companies:

• GRC dual-use agreement signed with Cognitek, re: materials technology; (GLITeC, NTTC).

• GRC Space Act agreement signed with QuesTek Innovations, re: materials technologies.

• GRC license agreement signed with Firefly Energy, Inc. re: energy conversion & use technology.

• MSFC signed two license agreements with Spartan Light Metal Products, re: metallic materials technology; (RTI).

Indiana

External Agent Affiliate:

• Indiana Business Modernization & Technology Corp. (Indianapolis, IN); (GLITEC).

Iowa

• NASA Research Partnership Center at Iowa State University, re: food technology.

Kansas

Engagement of Kansas non-profit entities:

Discussions with:

• University of Kansas Medical Center re: potential research partnerships with NASA JSC; (MCTTC).

• Johnson County Enterprise Center re: licensing opportunities with NASA JSC; (MCTTC).

• Kansas Technology Enterprise Center re: partnership and licensing opportunities with NASA; (MCTTC).

• University of Kansas re: partnership and licensing opportunities with NASA; (MCTTC).

• Pittsburg State University (Pittsburg, KS) re: partnership and licensing opportunities with NASA; (MCTTC).

• Kansas State University re: partnership and licensing opportunities with NASA; (MCTTC).

• Wichita State University re: partnership and licensing opportunities with NASA; (MCTTC).

• Kansas City Chapter of Licensing Executives Society re: technology diffusion strategy for the Kansas City region, including Kansas, Missouri, Nebraska and Iowa; (MCTTC).

Engagement of Kansas companies:

• ARC dual-use development agreement signed with Raytheon Aircraft Company, re: aeronautics software technology.

Kentucky

External Agent Affiliate:

• Kentucky Science & Technology Corporation (Lexington, KY); (SERTTC).

Engagement of Kentucky non-profit entities:

• ARC signed an agreement with Kentucky Science and Technology Corporation, re: space exploration related technology development; (SERTTC).

• Initiated and hosted Kentucky Innovation and Enterprise Conference to showcase R&D and technology development in all areas including those related to space for businesses and agencies involved in the economic development; (SERTTC).

• ARC and Kentucky Science and Technology Corporation co-hosted a Kentucky Day at ARC Moffett Field, CA re: space related research on subsurface exploration, unmanned vehicles development, and astrobiology; (SERTTC).

• Discussions with the Kentucky Science & Engineering Foundation, re: enhancing research in the astrobiology area; (SERTTC).

Engagement of Kentucky companies:

• Discussions with the Office for New Economy, Commonwealth of Kentucky, Commerce Lexington, Greater Louisville Inc., Innovation and Commercialization Centers, and other agencies involved in state of Kentucky economic development to acquaint business community with technology transfer opportunities with NASA; (SERTTC).

Louisiana

External Agent Affiliate:

• Lousiana Business & Technology Center at Louisiana State University (Baton Rouge, LA); (SERTTC).

Engagement of Louisiana companies:

• KSC dual-use development agreement signed with Toxicological & Environmental Associates, re: adaptation of existing commercial environmental technologies; (RTI; SERTTC).

Maine

External Agent Affiliate:

• RTI Maine (Yarmouth, ME); (RTI).

Maryland

External Agent Affiliate:

• Maryland Technology Development Corporation (Columbia, MD); (TeCC).

• NASA Research Partnership Center at the University of Maryland at College Park, re: satellite & hybrid communication networks.

• NASA sponsorship of the Emerging Technology Center (ETC) business incubator (Baltimore, MD).

Engagement of Maryland non-profit entities:

• MSFC memorandum of agreement signed with Universities Space Research Association.

• Discussions with the Maryland Business Incubator Association regarding enhancing opportunities for local small businesses via best practices identified from lessons learned; (TeCC).

• Co-sponsored the National Security Agency's technology partnering showcase at the Maritime Institute; other sponsors included NSA, NIST, Johns Hopkins University, University of Maryland; (TeCC).

• MSFC memorandum of agreement signed with Universities Space Research Association.

• Discussions with the Maryland Business Incubator Association (MBIA); (TeCC).

• Involvement with the Mid-Atlantic Regional Spaceport and the Mid-Atlantic Institute for Space technology; (TeCC).

• Discussions with The Maryland Technology Partnership for Innovation, a consortium of regional business schools, technology incubators, and economic development organizations in Prince Georges County, Baltimore City, and the Eastern Shore for the purposes of linking businesses with technology resources found in the federal laboratories; (TeCC).

Engagement of Maryland companies:

• GSFC license agreement signed with Design America, re: space satellite supporting technology.

• LaRC dual-use development agreement signed with Lockheed Martin, re: aeronautics technology.

• GSFC license agreement signed with A.I. Solutions, satellite tracking technology.

• LaRC signed dual-use development partnership agreement with Lockheed Martin.

• GSFC signed license agreement with Design America re: satellite support software.

• Presented technology transfer opportunities with NASA at the Patuxent River Partnership 7th Annual Business Development Symposium in Solomons, MD; (TeCC).

Massachusetts

External Agents:

• Center for Technology Commercialization (Westborough, MA); (CTC).

• NASA Research Partnership Center at Northeastern University, re: advanced materials technologies.

• Participated in the Hydrogen and Fuel Cell Summit sponsored by Rep. Jim McGovern's office; (CTC).

Engagement of Massachusetts non-profit entities:

• ARC partnership agreement signed with the University of Massachusetts re: bio-organic nanotechnology.

• GSFC dual-use development agreement signed with Beth Israel Deaconess Medical Center, re: information technology; (CTC).

• Discussions with Boston University officials to discuss licensing of high temperature fiber optic sensor technology; (CTC).

• Discussions with faculty at the Massachusetts Institute of Technology regarding facilitating technology transfer from all Massachusetts universities to local businesses; (CTC).

• Presentation to Worcester Polytechnic Institute Advisory Board meeting; (CTC, MCTTC). Speaker at WPI Lecture Series; (CTC)

• Discussions with the University of Massachusetts, Amherst re: nanotechnology partnership opportunities with NASA; (CTC).

• Discussions with the UMass Dartmouth School of Marine Science and Technology re: research and partnering opportunities with NASA; (CTC).

Engagement of Massachusetts companies:

• GSFC Boston Partnership Opportunity Workshop, for Industry; (CTC).

• Panel moderator at the Merrimack Valley Venture Forum; (CTC).

Michigan

External Agent Affiliate:

• Michigan Economic Development Corporation (Lansing, MI); (GLITEC).

Engagement of Michigan companies:

• GRC signed two space act agreements with United Solar Ovonics, re: energy conversion technologies.

Minnesota

External Agent Affiliate:

• Minnesota High Technology Association (Minneapolis, MN); (GLITEC).

Mississippi

• NASA Research Partnership Center at Stennis Space Center, re: technology development.

• SSC discussions with NAVY-CNMOC re: possible adaptation for NASA mission use of technology funded by the NAVY; (RTI).

External Agent Affiliate:

• University of Southern Mississippi (Hattiesburg, MS); (SERTTC).

Engagement of Mississippi non-profit entities:

• Participation in the Mississippi Development Authority Small Business Workshop; (SERTTC).

Missouri

External Agent Affiliates:

• Initiatives Worldwide, Inc. (Kansas City, MO); (MCTTC).

• Center for Emerging Technologies (St. Louis, MO); (MCTTC).

Engagement of Missouri non-profit entities:

Discussions with:

• Midwest Research Institute (MRI) re: opportunities for partnering with JSC on life science topics; (MCTTC).

• Greater Kansas City Chamber of Commerce Technology Committee re: partnering opportunities with NASA; (MCTTC).

• University of Missouri re: partnering opportunities with NASA; (MCTTC).

• Stowers Institute re: partnership opportunities in cancer research; (MCTTC).

• Kansas City Area Life Science Institute to discuss sponsoring a technology Show Case highlighting NASA research; (MCTTC).

• Washington University, School of Engineering and School of Medicine,
re: biomedical technologies. (MCTTC).

• St. Louis University, School of Engineering and Applied Sciences re: robotics technologies; (MCTTC).

Montana

External Agent Affiliate:

• Techlink Center at Montana State University (Bozeman, MT); (MCTTC).

Engagement of Montana non-profit entities:

• ARC dual-use agreement signed with University of Montana (MT) re: space flight technologies.

• ARC dual-use agreement signed with University of Montana (MT) re: space flight technologies; (MCTTC).

• Discussions with Montana Aerospace Development Association re: technology transfer opportunities for small businesses; (MCTTC).

• Co-sponsored the Montana Aerospace conference; (MCTTC).

Nevada

External Agent Affiliate:

• Nevada Small Business Development Center (Reno, NV); (FWRTTC).

Engagement of Nevada companies:

• JSC license agreement signed with Bigelow Aerospace Division, LLC, re: shielding technologies; (MCTTC).

New Hampshire

External Agent Affiliate:

• CTC-New Hampshire/Maine (University of New Hampshire, Durham, NH); (CTC).

• RTI New Hampshire (Amherst, NH); (RTI).

Engagement of New Hampshire non-profit entities:

• MSFC dual-use development agreement signed with University of New Hampshire re: remote sensing technology.

• Discussions with Dartmouth-Hitchcock Medical Center's concerning medical imaging applications of ARC and GSFC technologies, and joint-funded research with NSF; (CTC; FWRTTC).

• Initiated workshop at the University of New Hampshire to explore opportunities for partnering concerning GSFC Web technology; (CTC).

New Jersey

External Agent Affiliate:

• CTC-New Jersey (Bridgewater, NJ); (CTC).

Other engagement of New Jersey non-profit entities:

• Discussions with New Jersey Institute of Technology regarding commercial application potential of NASA-sponsored research projects; (CTC).

• Discussions with Rowan University research faculty involved in projects having partnership and spin-in opportunities for NASA; (CTC).

Engagement of New Jersey companies:

• GRC Space Act agreement signed with Honeywell International Inc., re: materials technologies.

• JSC dual-use development agreement signed with Wyeth Pharmaceuticals, Inc. re: biotechnology concerning human tissue modeling.

• Speaker at the New Jersey Technology Council meeting; (CTC).

New York

External Agent Affiliate:

• Upstate CTC (Rochester, NY); (CTC).

Engagement of New York non-profit entities:

• GSFC dual-use development signed with Syracuse University, re: optics technologies.

• Discussions with Center for Economic Growth in Albany, NY; (CTC).

• Discussions with Rochester Institute of Technology on NASA funded technology through the GSFC University Program; (CTC).

• Discussions with the University of Rochester on NASA funded technology through the GSFC University Program; (CTC).

• Discussion with Binghamton University, re: A Morphable, Energy-Efficient Space-Based Computing System; (CTC).

Engagement of New York companies:

• ARC dual-use agreement signed with Applied Theory Corporation, re: data exchange technologies.

• ARC dual-use agreement signed with BIO-MED Solutions, LLC (NY) re: space technology.

• ARC partnership agreement signed with Xerox, re: telemedicine/computing technologies.

• GRC Space Act agreement signed with Sulzer Metco, Inc., re: materials technologies.

• KSC signed dual-use development Space Act agreement with Taber Industries, Inc., re: electronic technology.

• KSC signed license agreement with Taber Industries, Inc. re: sensor technologies.

• Presentation at the Utica Business Forum; (CTC).

North Carolina

External Agent:

• Research Triangle Institute (Research Triangle Park, NC); (RTI).

External Agent Affiliate:

• Technology Transfer & Commercialization Center at North Carolina A&T University (Greensboro, NC); (SERTTC).

Ohio

External Agent:

• Great Lakes Industrial Technology Center (Cleveland, OH); (GLITeC).

External Agent Affiliate:

• EISC, Inc. (Toledo, OH); (GLITeC).

Engagement of Ohio non-profit entities:

• GRC signed an agreement with the Wright Technology Network to work cooperatively to advance the use and commercialization of Air Force and NASA technology in Ohio; (GLITeC).

• MSFC partnership agreement signed with Ohio University re: adaptation of existing X-ray product identification technology for NASA utilization.

• Participated in a conference on fuel cells sponsored by NASA GRC, the Ohio Department of Development, and the Air Force Research Lab; (GLITEC).

• Initiated and hosted meetings at Columbus Methodist Hospital and Riverside Methodist Hospital (Columbus, OH) with representatives from Cleveland Medical Clinic, regarding NASA technology for application intra-cranial pressure monitoring; (RTI).

IPP ACTIVITIES:

A SAMPLING OF INNOVATIVE PARTNERSHIPS PROGRAM'S REACH INTO LOCAL COMMUNITIES NATIONWIDE

Engagement of Ohio companies:
• GRC Space Act agreement signed with Goodyear, re: instrumentation technology; (GliTeC).
• GRC dual-use agreement signed with Ferro Corp., re: materials technologies; (GLITeC).
• GRC dual-use agreement signed with Chemsultants International, re: power technology; (GLITeC).
• GRC Space Act agreement signed with Ethicon Endo-Surgery, re: bio-medical technologies.
• GRC signed a Space Act agreement with Technology Management, Inc. (Cleveland, OH) re: fuel cell technology; (GLITeC).
• Participated in Ohio's Innovest, supporting small businesses developing advanced technologies (GLITeC).

Oregon

External Agent Affiliate:
• Northwest Innovative Business & Technology Center, Inc. (Portland, OR); (FWRTTC).

Engagement of Oregon non-profit entities:
• ARC partnership agreement signed with Oregon State University.

Engagement of Oregon companies:
• JPL license agreement signed with Agilent Technologies.

Pennsylvania

External Agent Affiliate:
• Pennsylvania Technical Assistance Program at Penn State University (University Park, PA); (TeCC).
• Participated in Entrepreneur Day in Harrisburg; (TeCC).

Engagement of Pennsylvania non-profit entities:
• Discussions with the Pittsburgh Life Sciences Greenhouse regarding local company partnering opportunities with NASA; (NTTC).
• Discussions with the Technology Collaborative re: partnering opportunities with NASA concerning robotics technologies; (NTTC).
• Discussions with the University of Pittsburgh Medical Center re: utilization by JSC of the university's cognitive measurement technology; (NTTC).
• Engagement in joint project to establish a pilot program with the Science Center in Philadelphia re: build businesses around NASA-developed technology; (TeCC).
• Engagement of Carnegie Mellon University regarding application of JPL sensor technologies for underground mining applications; (NTTC).

Presentations to:
• Penn State University Applied Research Lab re: partnering with NASA; (TeCC).
• Pennsylvania Department of Environmental Protection re: NASA technologies; (TeCC).
• The Centre County Pennsylvania Technology Council; (TeCC).
• The Centre County Business and Industry luncheon at State College, PA; (TeCC).
• The Johnstown, Pennsylvania Technology Council; (TeCC).
• The Northwest Technology Council (Erie); (TeCC).
• Discussions regarding NASA technology transfer partnership opportunities with:
  • New Cumberland Pennsylvania Section of the Instrument Society of America; (TeCC).
  • South Central, Pennsylvania Council at Chambersburg PA; (TeCC).
  • Several local businesses at the Showcase for Commerce in Johnstown, Pa; (TeCC).
  • Altoona-Blair County Development Corporation; (TeCC).
  • State of Pennsylvania Technology Investment Office officials, representing the interests of state private and academic entities; (TeCC).
  • Penn State University's Industrial Research Office, representing the interests of Pennsylvania firms; (TeCC).
  • University City Science Center in Philadelphia representing the interests of local firms; (TeCC).
  • Pittsburgh Technology Council; (NTTC).
• SSC Conducted a 25 company Dual-Use Partnership Opportunity Conference at PSU-Harrisburg; (SERTTC).

Engagement of Pennsylvania companies:
• GRC partnership agreement signed with Johnson Matthey, Inc. re: metallic alloy technology.
• JSC license agreement signed with ITA, Inc. re: biotechnology.
• KSC license agreement signed with Weston Solutions, Inc. re: ground water cleanup technology; (SERTTC, RTI).

Rhode Island

External Agent Affiliate:
• CTC-Rhode Island (East Providence, RI); (CTC).

Engagement of Rhode Island non-profit entities:
• Meetings with representatives of the Rhode Island Economic Development Corporation; (CTC).
• Discussions with faculty at the University of Rhode Island regarding possibility of utilizing ARC technology for use by the state to replace technology being phased out due to environmental concerns; (CTC, FWRTTC).
• Received grant from State of Rhode Island to provide services for the purpose of improving the competitiveness of Rhode Island companies; (CTC).
• Discussions with Brown University regarding partnering opportunities with NASA; (CTC).

South Carolina

External Agent Affiliate:
• Concurrent Technologies Corp. (Greenville, SC); (SERTTC).

Engagement of South Ca rolina non-profit entities:
• JSC NASA "Benefits of Space" trailer was hosted by Clemson University and attended by South Carolina companies and university professors and students.

Tennessee

External Agent Affiliate:
• Center for Industrial Services, University of Tennessee (Nashville, TN); (SERTTC).

Engagement of Tennessee non-profit entities:
• MSFC dual-use development agreement signed with Oakridge National Laboratory re: climate modeling.
• MSFC partnership agreement signed with Oakridge National Laboratory re: propulsion technology.
• MSFC partnership agreement signed with Oakridge National Laboratory re: carbon nanotube technology.

Engagement of Tennessee companies:
• MSFC dual-use development agreement signed with KT Engineering re: propulsion technology.

Texas

External Agent:
• Mid-Continent Technology Transfer Center at Texas A&M University; (MCTTC).
• NASA Research Partnership Center at Texas A&M University, re: space power technology.
• NASA Research Partnership Center at Texas A&M University, re: spacecraft technology.

Engagement of Texas non-profit entities:
• JSC dual-use development agreement signed with University of Texas - Medical Branch at Galveston (TX) re: biotechnology.

Engagement of Texas companies:
• JSC dual-use development agreement signed with Regenetech Inc., re: biotechnology.
• JSC dual-use development agreement signed with Cervenka, re: aeronautics technologies.
• MSFC dual-use development agreement signed with Texas Instruments, Inc., re: electronics technologies.

Vermont

External Agent Affiliate:
• CTC Vermont (North Ferrisburg, VT); (CTC).

Engagement of Vermont non-profit entities:
• Discussions with president of University of Vermont and Dean of Libraries and Information Technology at the University; (CTC).
• Discussions with executive director of incubator affiliated with University of Vermont concerning partnering opportunities with NASA; (CTC).
• Discussions with the University of Vermont on R&D applications incorporating the READ technology licensed from JPL by FemtoTrace for use in the dairy industry; (CTC).

Engagement of Vermont companies:
• LaRC license agreement signed with IVEK Corporation, re: medical instrument technologies; (NTTC).

Virginia

External Agent:
• Technology Commercialization Center (Hampton, VA); (TeCC).

External Agent Affiliate:
• Virginia Center for Innovative Technology (Richmond, VA); (TeCC).
• NASA Research Partnership Center at Virginia Commonwealth University, re: medical informatics technology.

Engagement of Virginia non-profit entities:
• Discussions regarding NASA technology transfer partnering opportunities with:
  • Hampton Economic Development Authority, representing the interests of local firms; (TeCC).
  • Central Virginia Regional Technology Council, with several local businesses in attendance; (TeCC).
  • Several Virginia companies at the Center for Innovative Technology in Herndon, VA; (TeCC).
  • Board of directors of the Hampton Roads Research Partnership, which represents the interests of local universities and colleges; (TeCC).

Engagement of Virginia companies:
• ARC dual-use development agreement signed with Dimensions Fight International, Inc., re: traffic tool management technologies.
• ARC dual-use development signed with High Performance Technologies, Inc., re: computing technologies.
• KSC license agreement signed with Telesto Group, LLC re: communications technologies; (NTTC, RTI).

Washington

Engagement of Washington companies:
• ARC signed dual-use agreement with Boeing Company, re: aeronautics technologies.
• ARC dual-use development agreement signed with Boeing, re: aeronautic technologies.
• GRC dual-use agreement signed with Sienna Technologies Inc. (WA) re: instrumentation technologies; (GLITeC).
• GSFC license agreement signed with Nytec, Inc., re: information systems.
• GSFC dual-use development signed with NyTech, re: information systems and robotics technologies.
• MSFC dual-use development agreement signed with Boeing, re: microgravity product research.
• MSFC license agreement signed with Nova Tech Engineering, Inc. re: aeronautics and defense technology.

West Virginia

External Agent:
• National Technology Transfer Center at Wheeling Jesuit College (Wheeling, WV); (NTTC).

External Agent Affiliates:
• West Virginia Governor's Office of Technology (Charleston, WV); (TeCC).
• Robert C. Byrd Institute (Huntington, WV); (TeCC).

Engagement of West Virginia non-profit entities:
• West Virginia High Tech Foundation; (TeCC).
• West Virginia University; (TeCC).
• West Virginia Army Air National Guard; (TeCC).
• West Virginia EPSCORE; (TeCC).
• Polymer Alliance Zone; (TeCC).
• West Virginia University Industries of the Future; (TeCC).
• West Virginia Teaming to Win; (TeCC).
• State of West Virginia Development Office, Energy Directorate; (TeCC).

Engagement of West Virginia companies:
• Discussions with West Virginia companies at a Charleston, WV Chamber of Commerce business meeting; (TeCC).
• Discussions with local companies at the West Virginia High Technology Consortium Foundation annual conference; (TeCC).

Wisconsin

External Agent Affiliate:
• Center for Advanced Technology & Innovation (Sturtevant, WI); (GLITeC).

Engagement of Wisconsin companies:
• GRC Space Act agreement signed with Phoenix International (Brookfield, WI), re: mechanical engineering and analysis.

Other Federal Government

• ARC dual-use development agreement signed with Department of Energy, re: development of advance detectors.
• ARC signed four dual-use agreements with the U. S. Dept. of Energy (CA, NV) re: electrical power technology.
• ARC dual-use agreement signed with Department of Interior, U.S. Geological Survey, re: ecosystems science and technology.
• ARC dual-use agreements signed with FAA, re: aviation safety technology.
• ARC dual-use agreement signed with Department of Homeland Security, re: environmental technology
• ARC dual-use partnership agreements signed with Naval Air Systems Command (MD) re: aerodynamics testing.
• ARC dual-use partnership agreement signed with U.S. Air Force Research Laboratory (OH) re: arc jet testing.
• MSFC partnership agreement signed with U.S. Coast Guard (NC).
• GRC partnership agreement signed with DARPA re: aeronautics technologies.
• GRC partnership agreement signed with DARPA re: composite materials technology.
• GRC Space Act agreement signed with NAVAIR re: laser technologies.
• GSFC dual-use development agreement signed with FBI, re: information technology.
• LaRC dual-use development agreement signed with the U.S. Army re: rotorcraft wind tunnel testing.
• LaRC dual-use development agreement signed with the CIA (VA).
• MSFC partnership agreement signed with Arnold Engineering Development Center (TN) re: space flight technology.
• MSFC partnership dual-use development agreement signed with U.S. Air Force Research Labs (NM) re: space flight hardware manufacturing.
• SSC partnership agreement signed with U.S. Navy – CNMOC re: technology mining; (RTI).
• SSC cooperative agreement signed with USDA NASS and Foreign Agriculture Service re: joint decision support system to predict world-wide fruit (particularly citrus) and nut crops.
• Discussions with the Mine Safety Health Administration re: partnering opportunities with NASA; (NTTC).
• Discussions with the National Cancer Institute re: partnering opportunities with NASA concerning diagnostic and treatment technologies; (NTTC).
• Discussions with Missile Defense Agency regarding obtaining assistance in identifying NASA technologies for possible use in MDA missions; (TECC).
• Co-sponsored the Nanotech showcase at Army Research Labs; (TECC).
• Facilitated renewal of MOU between NASA and National Institute of Justice for the purposes of identifying opportunities for joint development of technology, such as the ongoing joint X-ray Florescence project; (CTC).
• Facilitated a briefing at the Navy's Aviation Technology Review Board annual meeting to NAVAIR program officials regarding NASA technologies and capabilities; (RTI).
• LaRC partnership opportunities within DOD and DHS being explored; (RTI).
• Co-sponsorship of the Aberdeen Proving Grounds technology showcase, re: robotic and automotive technologies; (TeCC).
• Discussions re: transfer of NASA technologies for Department of Homeland Security applications; (NTTC).
• Speaker at the "Personal Locator Device Focus Group" involving the National Institute of Justice, U.S. Army Natick Labs, and Worcester Polytechnic Institute; (CTC).